Universidade de Lisboa

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THREE ESSAYS ON CORPORATE TAXATION:

FINANCIAL REPORTING, VALUE, AND FIRM CREATION

Victor Maurílio Silva Barros

Orientador: Professor Doutor João Carlos Carvalho das Neves

Tese especialmente elaborada para obtenção do grau de

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Abstract

The doctoral thesis is composed by three self-contained empirical papers that can be read independently, plus an introduction and a conclusive chapter.

The first empirical paper, which is entitled "Corporate Taxation and Financial Reporting Quality"[1], examines whether the relation between tax enforcement and firms' financial reporting quality varies with firms' level of tax avoidance in Europe. Incentives for tax avoidance are dissimilar across firms and jurisdictions, as the latter levy firms with different corporate taxation and employ different enforcement mechanisms. Thus, the simple view that higher tax enforcement increases the quality of financial reporting may also change with institutional characteristics. We predict and confirm that in Europe, overall tax enforcement is positively associated with financial reporting quality, although there is a greater incidence for firms engaged in more tax avoidance. We find a lower sensitivity to tax enforcement for firms engaged in less tax avoidance, which is consistent with the tendency for these firms to already report higher quality financial information. Furthermore, it is unclear whether our findings are sensitive to variations in other tax system characteristics and in institutional characteristics. In contrast to other studies, we show that the association between tax enforcement and financial reporting quality is sensitive to firms' level of tax avoidance, rather than accounting for other differences at country level.

The second empirical paper – "Disclosure of Income Taxes and Firm Value: a Cross Country Comparison of IFRS Adopters"[2], examines whether disclosure of income taxes is associated with firms' value. We focus on all IAS 12 disclosure requirements in a sample of IFRS adopters in Europe, rather than in the US. The disclosure of income taxes is measured by an index based on hand-collected data from annual reports, which made it possible to distinguish between mandatory and voluntary disclosure of income taxes. Results suggest no direct relation between mandatory disclosure of income taxes and firms' value. However, when the level of tax avoidance is taken into consideration the association is significant. Tax avoidance strategies are viewed with scepticism by investors, although disclosure of income taxes mitigates this negative effect, especially for tax aggressive firms, and for "poorly"-governed firms, which is measured by lower institutional ownership. Findings suggest that disclosure of income taxes might play a role in shaping the relation between tax avoidance strategies and firms' value, rather than the quality of corporate governance.

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[1] JEL classification: H26; K4; M40

Keywords: Tax Avoidance; Tax Enforcement; Financial Reporting Quality

[2] JEL classification: H26; G14; M41; G30

Keywords: Tax Avoidance; Disclosure; Firm Value; Market Reaction

The third empirical paper is entitled as "Crossing the Border: Regional Tax Differences and Firm Creation"[3]. Does the introduction of reduced corporate income tax rates at regional level increases firm creation? Instead of focussing on existing corporate income tax rate differentials, we take advantage of a quasi-natural experiment to study the introduction of reduced corporate income tax rates at regional level. Results suggest that the creation of firms increased with the introduction of reduced corporate income tax rates for specific regions. However, further variations in the corporate income tax rate differential between regions appear to be ineffective in fostering the creation of firms. Indeed, the effect on firm creation is robust regarding border competition, whereby neighbouring municipalities compete for corporate income tax rates. Job creation appears to be positively affected, these new firms are typically small, and the likelihood of their survival appears to be enhanced by the tax change. The findings also highlight the influence of agglomerations in order to take advantage of the tax change. Taken altogether, the findings contrast with the previous literature, which is focussed on existing tax rate differentials, as we demonstrate that what really triggers the creation of new firms is when a tax rate differential between regions is created.

[3] JEL classification: H25; L26; M13

Keywords: Business Taxation; Entrepreneurship; Firm Creation

Resumo

A tese de doutoramento é composta por três artigos empíricos autónomos que podem ser lidos de forma independente, a que se acrescenta um capítulo introdutório e um capítulo conclusivo.

O primeiro artigo empírico, intitulado de "Corporate Taxation and Financial Reporting Quality"[4], analisa se a relação entre o nível de fiscalização da administração fiscal e a qualidade do relato financeiro das empresas varia de acordo com o nível de planeamento fiscal das empresas na Europa. Os incentivos ao planeamento fiscal não são iguais entre empresas e jurisdições, uma vez que estas últimas fazem incidir nas empresas diferentes tributações empresariais e os mecanismos de fiscalização das administrações fiscais variam igualmente entre jurisdições. Nesse sentido, a visão clássica de que uma maior fiscalização da administração fiscal tem efeitos positivos na qualidade do relato financeiro das empresas pode variar de acordo com as características institucionais dos respetivos países. Neste artigo, é previsto e confirmado que na Europa uma maior fiscalização da administração fiscal exerce um efeito positivo na qualidade do relato financeiro das empresas, no entanto esse efeito é mais acentuado para as empresas com maior nível de planeamento fiscal. Verificou-se uma menor sensibilidade para as empresas envolvidas em um menor nível de planeamento fiscal, situação que é consistente com o facto de essas empresas já exibirem um relato financeiro de melhor qualidade. Adicionalmente, os resultados parecem não ser sensíveis a variações em outras características fiscais e em características institucionais. Em contraste com outros estudos, é evidenciado que a associação entre a fiscalização das administrações fiscais e a qualidade do relato financeiro das empresas é sensível ao nível de planeamento fiscal das empresas, ao contrário de estudos existentes que sugerem a existência de efeitos diferentes de acordo com características específicas dos próprios países.

O segundo artigo empírico – "Disclosure of Income Taxes and Firm Value: a Cross Country Comparison of IFRS Adopters"[5], analisa se a divulgação de informação sobre impostos sobre o rendimento relaciona-se com o valor das empresas. O foco recai sobre os requisitos de divulgação da IAS 12, sendo a amostra composta por empresas Europeias que adotaram as IFRS, em vez de empresas cotadas nos EUA que têm sido alvo de mais investigação. A divulgação de informação sobre impostos sobre o rendimento é medida através de um índice construído através de recolha de informação diretamente dos relatórios e contas das empresas, permitindo dessa forma distinguir a divulgação de informação com caráter obrigatório da divulgação de informação

[4] Classificação JEL: H26; K4; M40

Palavras-chave: Planeamento Fiscal; Fiscalização da Administração Fiscal; Qualidade do Relato Financeiro

[5] Classificação JEL: H26; G14; M41; G30

Palavras-chave: Planeamento Fiscal; Divulgação de Informação; Valor da Empresa; Reação do Mercado

voluntária, ambas sobre impostos sobre o rendimento. Os resultados sugerem que não existe relação direta entre a divulgação de informação sobre impostos sobre o rendimento de caráter obrigatório e o valor das empresas. No entanto, quando é considerado o efeito moderador das estratégias de planeamento fiscal, a relação acima descrita é significativa. As estratégias de planeamento fiscal são vistas pelos investidores com ceticismo, todavia a divulgação de informação sobre impostos sobre o rendimento mitiga esse efeito negativo, sobretudo para as empresas com práticas mais agressivas de planeamento fiscal, bem como para as empresas com menor qualidade do *corporate governance*, medido por uma menor presença de investidores institucionais na estrutura acionista das empresas. Os resultados sugerem que a divulgação de informação sobre impostos sobre o rendimento pode desempenhar um papel importante na definição da relação existente entre as estratégias de planeamento fiscal e o valor das empresas, ao invés da qualidade do *corporate governance*.

O terceiro artigo empírico é denominado de "Crossing the Border: Regional Tax Differences and Firm Creation"[6]. Será que a introdução de taxas de imposto sobre o rendimento empresarial reduzidas ao nível regional aumenta a criação de empresas? Em vez do foco recair sobre diferenciais de taxas de imposto já existentes entre regiões, este estudo toma partido de uma aproximação a uma experiência natural para analisar o momento da introdução de taxas de imposto sobre o rendimento empresarial mais reduzidas para algumas regiões. Os resultados sugerem que a criação de empresas aumenta com a introdução de taxas de imposto reduzidas sobre o rendimento empresarial. Contudo, variações posteriores no diferencial de taxas de imposto entre regiões parecem não ser eficazes para fomentar a criação de empresas. Além do mais, o efeito na criação de empresas parece ser influenciado por competições fiscais regionais, nas quais municípios vizinhos podem competir ao nível das taxas de imposto sobre o rendimento empresarial. A criação de emprego parece ser positivamente afetada com a alteração fiscal, as novas empresas são tipicamente de pequena dimensão e a probabilidade de sobrevivência parece melhorar como consequência da alteração fiscal. Os resultados também salientam a importância dos aglomerados para que as empresas aproveitem a alteração fiscal. Em geral, os resultados contrastam com a literatura que foca-se em diferenciais de taxas já existentes entre regiões, uma vez que neste estudo é demonstrado que o período mais relevante para despoletar a criação de novas empresas é o período da criação de um diferencial de taxas entre regiões.

[6] Classificação JEL: H25; L26; M13

Palavras-chave: Tributação Empresarial; Empreendedorismo; Criação de Empresas

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1. Introduction and Thesis Overview

1.1. Introduction

Research in taxation addresses several interesting questions with practical implications for society. How do firms' tax avoidance strategies and enforcement by tax administrations shape firms' financial reporting? Why do some firms disclose more information about income taxes than others do, and how do investors value disclosure? Does the introduction of reduced corporate income tax rates in specific locations triggers firm and job creation? These questions are addressed in the three self-contained empirical papers of this thesis.[7] The three empirical papers study different issues with a common theme: corporate taxation. This thesis is therefore connected to at least three strands of literature on taxation: (i) literature on tax enforcement and tax compliance; (ii) literature on disclosure of tax information, and; (iii) literature on tax incentives. This thesis therefore explores the consequences of corporate taxation on *financial reporting, value, and firm creation.*

Governments have put in place mechanisms to enforce their claims over firms' pre-tax earnings. These enforcement mechanisms might well shape firms' decisions with regards to tax avoidance strategies, which inevitably influences financial reporting. On the other hand, the disclosure of income taxes during the financial reporting process might be viewed by shareholders in a twofold rational, as is discussed further below. On the other hand, governments might implement tax incentives in order to trigger

[7] Throughout this thesis, we refer to the tax administration as being the government agency with the main legal responsibility for tax assessment and collection, including the enforcement of the tax law. In the tax literature, the tax administration is sometimes referred as the tax authority, although both designations refer to the same organisation.

economic growth and job creation, such as lowering corporate income tax rates. An understanding of the several ramifications of the consequences of tax systems through different perspectives is required to shape tax environments in a more competitive manner. For instance, the recent 'tax inversion' in the US, which followed on from the fact that most firms are subject to high corporate income tax rates, shows the need to link taxation as a part of accounting research with taxation as party of economic research. By means of mergers and acquisitions, firms are shifting their domicile abroad to low-tax countries, such as the UK, the Netherlands, and Finland. These firms are also starting to relocate executives and head-office functions to the new tax domicile, as a tactical manoeuvre in order to anticipate the more demanding requirements of low-tax jurisdictions (The Economist, 2015, p. 57). As a consequence of the 'tax inversion' of some of US larger firms, The Economist (2015, p. 57) says that "America is starting to lose not just tax revenues but jobs too".

1.1.1. Taxation as a Multidisciplinary Field of Study

Taxation is a multidisciplinary field of study, in which researchers often focus on taxation through complementary perspectives. As suggested by Lamb, Lymer, Freedman, and James (2005), taxation is part of other traditional research fields, such as the fields of: (i) legal research; (ii) economic research; (iii) accounting research; (iv) social policy research, and; (v) political science research. Most of the time these fields are connected, which partially justifies why several researchers have focussed their studies on taxation as a combination of traditional research fields. For instance, there is an evident overlap between taxation research as accounting research and as economic research. The barrier between the two research fields might be tenuous. A decision-making process which is part of economic literature might exert a certain

influence on another decision that is studied in accounting literature. For instance, let us consider a government's decision to implement tax incentives in order to foster firm creation and as a way of encouraging the relocation of existing firms, which is reported in the economic and public finance literature. The intention of these existing firms might be to relocate their headquarters as a pure tax avoidance strategy and, inevitably, the relocation of headquarters, in one way or another, will influence firms' financial reporting. In addition, the organisational form might shape firms' tax avoidance strategies. These topics are also widely studied in the accounting and finance literature.

From the perspective of taxation for both accounting and economic research, the range of issues emphasised in the literature is broad, and some of them are still far from consensus. Taxation in the accounting and finance literature "includes tax research that contributes to academic literature on the measurement and reporting of accounting information, the management and organisation of accounting functions, and the interaction between accounting information and capital market behaviour and individual financial decision making." (Lamb, 2005, p. 62). Of particular interest for the thesis is the measurement and reporting of accounting information, combined with its interaction to capital markets (Chapter 3). In addition, how corporate tax avoidance strategies shape firms' financial reporting response to tax enforcement mechanisms (Chapter 2).

Taxation in economic literature focusses on the influence of taxation on the production and distribution of wealth (James, 2005), which is mostly covered by the public finance literature. In the words of James (2005), "a general theme in tax research [as economic research] is how the necessary tax revenue to support the public sector can be raised in the most efficient and equitable way". The primary goal of corporate taxation is to capture resources (tax revenues) from the economic activity and to further

return these resources to society, though a balance between the equal redistribution of income and the supply of public goods. This implies that corporate taxation inevitably affects a wide range of economic decisions. Governments have mechanisms for conquering these goals. Monetary policy and fiscal policy play a role in determining economic growth, low levels of unemployment, and price stability (James, 2005). For example, the introduction of tax incentives might shape firms' and individuals' incentives to work, save, and invest. Chapter 4 of this thesis focusses specifically on the consequences of tax incentives on decisions to create firms.

In recent years, research in taxation started to link different research fields and perspectives. In particular, researchers started to link public policies with financial accounting. The testimony about tax reform options in the US of Michelle Hanlon, a leading tax researcher and the editor of the Journal of Accounting and Economics, illustrates the complementarity of these research fields:

> "The main point of my testimony is that financial accounting implications for publicly traded companies can influence the effectiveness of tax policies, including policies related to investment. The financial accounting effects represent a non-tax cost (or benefit) that public companies consider in their decision-making process. Thus, public companies' responses to tax policies are not only governed by the tax effects, but also the financial accounting effects, often producing unintended consequences." (Hanlon, 2012)

Michelle Hanlon highlights the fact that some tax policies influence firms' financial reporting and that managers trade-off both issues during their decision-making process. Furthermore, in a review of accounting quality literature with the adoption of IFRS, Soderstrom and Sun (2007) explain that legal and political systems influence accounting quality, not only through accounting standards, but also via other incentive forms, such

as taxation.[8] Indeed, all levels of Devereux and Maffini (2007) framework on multinational decisions are found in both accounting and economic research about taxation.[9] For instance, location decisions proxied by foreign direct investment (FDI) flows appear to be positively influenced by corporate income tax rate cuts (de Mooij & Ederveen, 2003). On the other hand, there is evidence in the literature that firm's ownership structures are chosen as a response to legal and tax rules which are imposed by host countries (Lewellen & Robinson, 2013). Moreover, flexibility in reporting is valuable during the decision to locate investments (Shackelford, Slemrod, & Sallee, 2011). Dyreng and Lindsey (2009) focus on multinationals' decisions to locate their investment. They find out that operations in tax havens might benefit tax collection in a non-tax haven country in some cases. These are some examples of the interminglement of tax literature as accounting and as economic research that may fit into the same theoretical framework.

In this doctoral thesis, both accounting and economic approaches to taxation can be found. This is not a result of the research developed in each empirical paper covering different perspectives to study the same issue. Rather, the focus of the self-contained empirical papers is on different issues which should be studied through different perspectives of taxation research. It should be added that research in taxation developed in this thesis is always of a positive nature, rather than of a normative one.

1.1.2. Philosophical Approach

Research in taxation is dominated by a positivist approach to knowledge. The positivist approach is found in several ramifications of research in taxation, and in

[8] IFRS is used here intangibly to refer to the accounting standards issued by the International Accounting Standard Board (IASB) which were adopted by the European Commission.

[9] This framework is detailed in Section 1.3.

particular, in research in taxation as accounting and economic research. This is a consequence of research in taxation being developed through using sophisticated data analyses. Nevertheless, the study of Oats (2012, p. 6) claims the need for tax researchers to "become more reflexive and receptive to methodological and philosophical debates taking place in other disciplines". The author attempts to provide a framework for a stream of research in taxation which is based on philosophical approaches other than positivist ones.

I position myself as being pragmatic in terms of the way I understand scientific knowledge. The research methods developed are of secondary interest, which means that the research questions being studied are the central issue. Decisions regarding research methods are of second-order of importance and are adapted to not only the research questions, but also to the field of study. Nonetheless, the research conducted in this thesis is of a positivism nature. Quantitative data is essential for answering research questions in each empirical paper of this thesis. Thus, the interpretation of the effects of corporate taxation in this thesis is not biased on the researcher's view of the phenomenon being studied, and conclusions drawn from econometric analyses might be generalised to other contexts.

1.2. Corporate Tax Avoidance

1.2.1. Definition

There is no consensus in the literature regarding a common definition of corporate tax avoidance. Some authors define the activity of avoiding taxes broadly. For instance, Hanlon and Heitzman (2010) define tax avoidance as being "the reduction of explicit

taxes". Dyreng, Hanlon, and Maydew (2008) narrow the definition to a time range: "anything that reduces the firm's cash effective tax rate over a long time period, i.e., ten years". These definitions somehow include both legal and illegal means of reducing firms' tax liability, as it is hard to assess the boundaries of legality. Some authors omit illegal activities from their definition of tax avoidance. For instance, Slemrod and Gillitzer (2014, p. 11) consider that tax avoidance strategies are in place when "taxpayers will re-arrange their affairs to legally reduce their tax liability, including efforts to reduce their tax liability without altering real activities". Tax avoidance might be defined as being just "legal actions taken to reduce tax liability" (Slemrod, 2004). Similarly, the Cambridge Business English Dictionary defines tax avoidance as being "a legal way of reducing the amount of tax a person or company would normally pay"[10].

Sometimes the literature refers to tax avoidance and tax aggressiveness intangibly, and states that both include legal and illegal means of reducing corporate tax liability. Researchers often limit tax avoidance to legal activities, although they use proxies that inevitably capture both legal and illegal activities. Throughout this thesis, we adopt a broad definition of corporate tax avoidance of Dyreng et al. (2008), and do not distinguish between legal and illegal activities of avoiding taxes. The term tax evasion is exclusively used to refer to illegal activities.

The concept of tax avoidance is narrowed in the literature to tax aggressiveness, which is further narrowed to tax sheltering. Tax aggressiveness, as a component of tax avoidance, can be defined as "behavior in which tax burden reduction is of first order importance, with pre- or non-tax effects viewed as second-order, or marginal" and tax aggressiveness "is a matter of judgment, degree, and scope" (Lisowsky, 2010). To

[10] Available online at: http://dictionary.cambridge.org/dictionary/english/tax-avoidance .

address a broad definition of corporate tax sheltering, the Treasury (1999) highlights its main characteristics as including "lack of economic substance; inconsistent financial and accounting treatment; presence of tax-indifferent parties", amongst others. More recently, Bankman (2004) refers to tax shelters as being "an activity that runs counter to the intent of the legislature, so that we may expect that once a shelter becomes public, the legislature will take steps to shut down the shelter". Being transactions prohibited by tax administrations, tax shelters are more severe than tax aggressiveness (Lisowsky, 2010), and are a special case of corporate tax avoidance which is likely to include illegal means of reducing firms' tax liability.

1.2.2. Measuring Corporate Tax Avoidance

To complement the broad definition of corporate tax avoidance presented above, among other related definitions, the literature has addressed several measures of corporate tax avoidance. Hanlon and Heitzman (2010) synthetise twelve tax avoidance measures and then group them into six groups: (i) effective tax rate measures; (ii) long-run effective tax rates; (iii) book-tax differences; (iv) discretionary or "abnormal" measures; (v) unrecognised tax benefits, and; (vi) tax shelters. More recently, Jacob and Schütt (2015) propose a new tax avoidance measure, based on a tax planning score, which captures the relation between historical levels of tax avoidance and variations in statutory tax rates. There is no universal consensus regarding a unique measure of corporate tax avoidance, either in the literature, or in practice. Which measures are taken into consideration in managers' decision-making processes? Graham, Hanlon, Shevlin, and Shroff (2015) provide important insights into this issue by surveying approximately 500 managers from both public and private US firms. They find out that statutory tax rates or effective tax rates are preferred by managers in their

decision-making process, rather than marginal tax rates, which are more complex to compute, due to features of the tax code on corporate income.[11]

A major constraint for establishing a common measure of tax avoidance might arise from several reasons. Firstly, information from firms' financial statements should be complemented with firms' tax returns, although the latter is rarely disclosed, either by firms, or by tax administrations. Whether tax returns should be public is a question which is already addressed in the literature, although far from our scope. The research of Lenter, Slemrod, and Shackelford (2003) on this topic is widely recommended. Secondly, each measure focusses on different issues of corporate tax avoidance, which might include conforming and non-conforming tax avoidance. By conforming tax avoidance, we refer to strategies "in which financial accounting income is reduced when the tax strategy is employed" (Hanlon & Heitzman, 2010).

The first two groups of tax avoidance measures are often combined and comprise the main proxies used throughout this thesis. These effective tax rate measures influence both profits and liquidity. Distinguishing between the two impacts depends on whether a researcher focusses on book-based measures, or cash-based measures. Measures that only influence profits are indeed incomplete for use as a proxy for tax avoidance, as they mostly capture current tax expense and do not consider deferral tax strategies. Dyreng et al. (2008) developed the measure labelled as "long-run cash effective tax rate" (*LCETR*)[12], which extends a previous measure – the cash effective tax rate over one year (*CETR*). They show that *LCETR* captures long-run tax avoidance strategies more accurately and exhibits higher comparability across firms than other tax avoidance

[11] Marginal tax rates correspond to the present value on taxes of an additional dollar of income, and are computed considering specificities of the tax code.

[12] *LCETR* is measured as being the aggregate cash tax paid to the tax administration over a time range (three, five, or ten years), scaled by aggregate pre-tax earnings within the same time range. For ease of interpretation, this measure is often either inverted or transformed as one minus the base *LCETR*.

measures, due to its ease of calculation. As it measures the overall cash tax paid to the tax administration scaled by firms' overall pre-tax earnings in a wide time range, *LCETR* is not biased to the source of income and whether taxes are already paid. It therefore captures firms' global tax avoidance strategies, thus allowing researchers to perform cross-section comparisons.

1.2.3. Competing and Complementary Theories on Corporate Tax Avoidance: the Traditional Perspective versus the Agency Perspective

The traditional perspective on corporate tax avoidance argues that managers, by engaging in tax avoidance strategies, behave in their shareholders' best interest – which is a mechanism to transfer value from the State to shareholders. Tax avoidance strategies decrease firms' tax liability, and thus increase the present value of future cash flows available to shareholders. This corresponds to most of the framework of the classical work of Scholes, Wolfson, Erickson, Maydew, and Shevlin (2009, p. 3), as "the taxing authority is an uninvited party to all contracts". Under the traditional perspective on corporate tax avoidance, shareholders are expected to respond positively to news about firms' involvement in strategies for avoiding taxes. However, recent empirical evidence states that shareholders might penalise, or might not value tax avoidance strategies (e.g., Desai and Dharmapala (2009a); Wahab and Holland (2012)).

A baseline assumption underlying most of the literature in taxation is that firms have an incentive to pay less taxes. Nevertheless, firms might be constrained by some tax strategies, due to non-tax costs, such as reputational ones (e.g., Gallemore, Maydew, and Thornock (2014); Graham, Hanlon, Shevlin, and Shroff (2014); Austin and Wilson (2015)). The recent Starbucks tax scandal in the UK is an example of the high

reputational costs of corporate tax avoidance strategies.[13] A more prominent question is whether managers might be interested in paying more taxes. This question confronts a large stream of the literature in taxation. Recent developments in the taxation literature has brought controversy to this question. For instance, Erickson, Hanlon, and Maydew (2004) found evidence that firms pay more taxes in order to inflate accounting earnings. This finding calls for the primitive conflict of interest between the agent and the principal. This conundrum in the empirical evidence led to tax researchers refocussing on determinants of corporate tax avoidance, which resulted in the consolidation of the agency perspective on corporate tax avoidance (Desai & Dharmapala, 2009b).[14]

The agency perspective on corporate tax avoidance incorporates agency tension between managers and shareholders, as managers might use tax avoidance strategies as a mechanism of managerial opportunism and rent diversion. Desai and Dharmapala (2006) theorise that firm value is reduced if managers have both the incentive to reduce the corporate income tax liability through the understatement of taxable income, and the opportunity to understate the accounting profit. Chung, Goh, Lee, and Shevlin (2015) demonstrates empirically that, in fact, managers extract rents from shareholders through tax avoidance strategies, and the effect is mitigated for firms with better monitoring mechanisms. According to the agency perspective on corporate tax avoidance, strategies for avoiding taxes lead to a lack of transparency, whereby information asymmetry increases. Despite the increase in free cash flows from tax avoidance strategies, shareholders place a premium on the increase of information asymmetry, by raising their cost of equity capital (e.g., Francis, Khurana, and Pereira (2005)). This behaviour

[13] When the introduction of a tax scheme which led to paying almost no corporate taxes in the UK was revealed to public, Starbucks faced a drop in sales and decided to voluntarily give about £20 million to the British tax authority in 2014, in order to prevent protests and boycotts that were affecting its sales.

[14] Desai and Dharmapala (2009b) refer to this as "narrowly, an 'agency perspective on tax avoidance' or, more broadly, as the 'corporate governance view of tax avoidance'.".

takes place because shareholders do not exclusively care about expected future cash flows (Shackelford et al., 2011). Instead, in their real decisions they are also concerned about managers' discretion over the timing of taxable income and/or book income (Shackelford et al., 2011). Likewise, shareholders view some tax avoidance strategies negatively, as they may be a sign of involvement in tax fraud and tax shelters, amongst others (Hanlon & Slemrod, 2009).

To the best of our knowledge, the agency perspective on corporate tax avoidance incorporates two dimensions. Firstly, compensation arrangements to align managers and shareholders. Desai and Dharmapala (2006) find that incentive compensation is a significant determinant of tax avoidance activities across firms. On the other hand, Minnick and Noga (2010) suggest that incentive compensation drives tax avoidance in the long-run, leading to higher returns for shareholders. Armstrong, Blouin, Jagolinzer, and Larcker (2015) find that the effect exerted by corporate governance on tax avoidance is found at the upper and lower tails of tax avoidance distribution. The effect is positive (negative) in the lower (upper) tail, meaning that different agency issues might arise from both extreme levels of tax avoidance. Ammann, Oesch, and Schmid (2011) construct two corporate governance indices, based on a set of 64 individual governance attributes. They find a statistically positive association between firm's level of corporate governance and firm's valuation. After tracking executives that served as top executives at more than one firm, Dyreng, Hanlon, and Maydew (2010) find evidence that individual executives (either CEOs or CFOs) play a significant role in determining the level of tax avoidance. Armstrong, Blouin, and Larcker (2012) demonstrates that incentive compensation of the tax director is negatively associated with firm's GAAP effective tax rate, which is a component relatively controllable by the

director. Empirical evidence also shows that managers who are personally tax aggressive, tend to encourage their companies to be tax aggressive (Chyz, 2013). Badertscher, Katz, and Rego (2013) suggest that greater separation between ownership and control leads to tax aggressiveness. In line with this finding, Chen, Chen, Cheng, and Shevlin (2010) provide evidence that non-family firms are more tax aggressive than family firms (i.e., firms that are owned or run by founding family members).

The second dimension regards enforcement by tax administration, which might facilitate shareholders in monitoring managers' actions. Tax enforcement will likely involve penalties for detected non-compliance (Crocker & Slemrod, 2005), and thus higher enforcement might decreases managers tendency to practice tax avoidance. Consequently, this helps aligning managers and shareholders in a model where shareholders view tax avoidance as a value-diversion strategy. Xu, Zeng, and Zhang (2011) provide evidence for this second dimension, in which tax enforcement may serve as a corporate governance mechanism.

In a paper entitled '*Theft and Taxes*', Desai, Dyck, and Zingales (2007) design a triangular game for explaining the dynamics of firms' value diversion and the amount of taxes paid. This triangle includes the vertex of firms' Insiders, the one related to Outsiders (shareholders), and also a vertex that represents the State. They argue that a spillover effect in a third vertex is found as a result of each bilateral interaction. Insiders and Outsider shareholders may well collude regarding tax avoidance strategies, in order to divert value from the State, by lowering corporate income tax payable. This is the rationale under the traditional perspective on corporate tax avoidance. On the other hand, the tax administration and Outsider shareholders might have a similar interest in controlling Insiders, by which the tax administration might help to discipline Insiders.

In a third interaction, Insiders might promote interest with the tax administration, if they are allowed to maximise their wealth, at the expense of sacrificing shareholder value creation. We add to the intuition of Desai et al. (2007), that tax incentives are somewhat a form of collusion between firms and tax administrations, which might either promote, or constrain shareholders' value.

1.3. Contextualising this Research

Devereux and Maffini (2007) set out a decision tree framework of four levels for the decisions that multinational firms face in an international context, in which taxation plays a role. They state that the primarily decision faced by firms is a location decision – where to locate a new plant (first level) and in how many jurisdictions a multinational should be located (second level). This address an important question: whether to produce at home and export, or to produce abroad? These two levels regard discrete choices that are expected to be relatively stable throughout time. On the contrary, the third and fourth levels of decision-making are dynamic, as they involve continuous choices and are conditional on the location decision in the first two levels. These levels of decision-making relate to the amount of capital expenditures applied in each jurisdiction (third level), and to the allocation of profits (fourth level). While the first, second, and third levels of decisions concern investment decisions, the fourth level relates to profit decisions. Both the accounting and economic perspectives of the tax literature study all of these levels of decisions.

To 'control' the effect of tax avoidance on managers decisions, governments might put several policies into place. Crocker and Slemrod (2005) address two policy responses to tax avoidance. The first implies adjustments to tax codes in order to ease

detection and further prosecution of taxpayers with detected illegal tax avoidance. Secondly, the strengthening of penalties to be applied to these evaders. At least a third and a fourth policy responses might also be addressed. The requirement of additional financial reporting in order to ease the assessment of firms' taxable income and the detection of illegal tax avoidance. Fourthly, governments might shape tax avoidance by implementing tax incentives, or through corporate income tax rate cuts. The three self-contained empirical papers of this thesis fit with the insights of Devereux and Maffini (2007) and Crocker and Slemrod (2005).

1.3.1. The Role of Tax Enforcement on Financial Reporting

Whether or not higher tax enforcement should be in place for the benefit of all taxpayers is a decision which is often faced by governments. A "tighter enforcement is sometimes a more socially desirable way to raise revenue than an increase in statutory tax rates. Increased enforcement raises administrative costs but does not impose a greater burden on compliant taxpayers." (Slemrod & Gillitzer, 2014, p. 8). However, enforcement might also spread benefits to shareholders. Tax enforcement by the tax administration might serve as a mechanism to mitigate the 'agency problem' between firms and shareholders. Desai et al. (2007) argue that tax enforcement disciplines managers, by discouraging wealth diversion from shareholders, which means that tax enforcement should mitigate incentives for tax avoidance. A major assumption of this stream of literature is that managers are not aligned with shareholders' interests. Whereas several studies seem to indicate that higher enforcement exerts a positive effect on tax compliance (e.g. Slemrod, Blumenthal, and Christian (2001); Wenzel and Taylor (2004); Telle (2013); Carrillo, Pomeranz, and Singhal (2014); Pomeranz, Marshall, and Castellon (2014); Castro and Scartascini (2015)), it is not clear to what extent financial

reporting is affected. The reason why firms' financial reporting quality might be improved by higher enforcement by tax administrations is due to a spillover effect from the incentives for tax avoidance, as managers' choices over tax issues inevitably influence the quality of financial information reported to outsiders. Financial reporting is a mechanism for dealing with information asymmetry between managers and shareholders. Recent evidence suggests that tax enforcement decreases information asymmetry by triggering financial reporting of a higher quality (Hanlon, Hoopes, & Shroff, 2014).

Chapter 2, which corresponds to the first self-contained empirical paper, focusses on decisions that fit into both discrete and continuous choices of Devereux and Maffini (2007) framework. This aims to understand the role of corporate tax avoidance in the relation between tax enforcement and firms' financial reporting quality. Hanlon et al. (2014) in a US-based study demonstrate that tax enforcement is positively associated with financial reporting quality, due to a spillover effect from firms' tax avoidance strategies. The spillover effect is a key assumption in their study, although it is not tested, as their focus is on the quality of corporate governance.

A large amount of field studies find an overall positive relation between enforcement by the tax administration and taxpayers' compliance, and this effect might: vary with firm size (Pomeranz et al., 2014); vary with level of income (Slemrod et al., 2001); depend on previous tax audit experiences (e.g., Kleven, Knudsen, Kreiner, Pedersen, and Saez (2011); Telle (2013); DeBacker, Heim, Tran, and Yuskavage (2015)); imply adjustments to both revenue and declared costs (Carrillo et al., 2014); depend on whether audit rates from the tax administration are made public (Alm, Jackson, & McKee, 2009), and; depend on whether tax enforcement mechanisms provide

instructions regarding self-reporting (Wenzel & Taylor, 2004). The studies of Hoopes, Mescall, and Pittman (2012) and Atwood, Drake, Myers, and Myers (2012) also find a negative association between tax enforcement and tax avoidance, although they fail to understand whether this relation is strong for all levels of the tax avoidance distribution. The simple view that tax enforcement mitigates tax avoidance, which in turn improves financial reporting quality, is not clear in the literature, especially outside the US, and this is a gap in the literature that requires further research.

Through an analysis using 5,579 firm-year observations of firms listed on the stock exchange of 14 European countries, over a time range from 2005 to 2011, is tested as to whether firms' level of tax avoidance plays a crucial role in the relation between tax enforcement and financial reporting quality. The research question in Chapter 2 is as follows:

Does the influence of countries' tax enforcement on firms' financial reporting quality varies with firms' level of tax avoidance?

In addition to answering this question, the main objectives in this Chapter are to assess whether:

- higher tax enforcement by tax administrations improves firms' financial reporting quality;
- the relation described above is driven either by firms' level of tax avoidance, or by statutory corporate income tax rates at country level;
- countries' preferences for book-tax conformity influences the relation between tax enforcement and financial reporting quality;

- the relation between countries' tax enforcement and firms' financial reporting quality varies according to countries' legal origin.

1.3.2. The Role of Disclosure on Firm Value

Regarding the third policy response to tax avoidance, which is described in Section 1.3 – through financial reporting – the literature points out that corporate misreporting is an important source of illegal tax evasion (Slemrod, 2004). The corporate information environment is comprised of three types of decisions (Beyer, Cohen, Lys, & Walther, 2010): (i) managers' voluntary disclosure decisions; (ii) disclosures mandated by regulators, and; (iii) reporting decisions by analysts. The focus of the second empirical paper (Chapter 3) is on the first two types.

Listed firms are required to provide information to stakeholders, in order to mitigate information asymmetries. The disclosure of tax-related information is a mechanism for increasing the transparency of tax avoidance activities, although two types of players are more likely to be interested in the disclosure of income taxes – shareholders and the tax administration. Both players share an interest in firms' profits. Shareholders expect to be rewarded with a fraction of a firms' net profits, whereas the tax administration acts as a masked shareholder, claiming a priority interest in pre-tax profits (Scholes et al., 2009). How these players value disclosure of income taxes is an open question in the literature of taxation as accounting research.

Do firms' corporate tax avoidance strategies influence the disclosure of information about income taxes? How do investors value the trade-off between more information on income taxes and tax avoidance strategies? These questions are developed in Chapter 3,

and are connected to the fourth level of decision making of Devereux and Maffini (2007) framework. The tax literature on accounting research focusses on listed firms, due to a wider availability of data – annual financial reports and (occasionally) tax fillings. In the second empirical paper (Chapter 3) a cross-country analysis is performed in 2012 between 185 firms listed on the stock exchanges of 8 European countries. The research question under this paper can be summarised as:

Is disclosure of income taxes in the notes to the financial statements associated with firms' value?

Considering data features and research design, the main objectives proposed in Chapter 3 are to:

- understand the determinants of firms' mandatory disclosure of income taxes under IAS 12 requirements, especially the role of tax avoidance;
- understand the determinants of firms' voluntary disclosure of income taxes, especially the role of tax avoidance;
- assess whether there is a direct relation between disclosure of income taxes and firms' value;
- assess whether firms' level of tax avoidance is a mechanism by which disclosure of income taxes differently influences firms' value;
- assess whether the effect of disclosure of income taxes on firms' value varies according to corporate governance quality.

1.3.3. The Role of Tax Incentives on Firm Creation

Regarding the fourth policy highlighted above in Section 1.3, Klemm (2010) systematise tax incentives as follows: (i) tax holidays; (ii) special zones; (iii) investment tax credits or allowances; (iv) accelerated depreciation; (v) exemptions from various taxes; (vi) financing incentives, and; (vii) reduced tax rates. The latter type of tax incentive is the focus of the third empirical paper of this thesis (Chapter 4).

Theoretically, tax rate reductions decrease the incentives for tax avoidance, as they decrease the return of tax avoidance strategies (Desai et al., 2007). Tax avoidance strategies involve, amongst others, the managing of profits towards jurisdictions that levy a lower rate of corporate tax. Nevertheless, recent literature has come to demystify this issue. For instance, Dischinger, Knoll, and Riedel (2014) find that firms prefer to locate their earnings in the headquarters' jurisdiction, even when corporate taxes are higher than those of other jurisdictions in which firms operate. Specifically, a significant flow of income is shifted from subsidiaries to parent firms when parent firms face lower corporate income tax rates, whilst the opposite movement is reduced by more than 70%, when subsidiaries face a lower corporate tax burden than the parent (Dischinger et al., 2014). Corporate taxation is indeed a mechanism for influencing the location of existing and new firms. Djankov, Ganser, McLiesh, Ramalho, and Shleifer (2010) and Da Rin, Di Giacomo, and Sembenelli (2011) focus on the effect of corporate taxes on firm creation across countries. Both studies find a significantly negative effect of corporate income taxation on entry rates. Nevertheless, de Mooij and Nicodème (2008) point out that lower corporate income tax rates exert an ambiguous effect on entrepreneurship. These studies perform cross-country comparisons which focus on

existing corporate income tax rate differentials, rather than on the first creation of the differential.

Chapter 4 focusses on the period of creation of a fiscal policy which was designed to trigger firm creation in specific locations, and is connected to the first level of decision-making of Devereux and Maffini (2007) framework, although it is not exclusive to multinational firms. The scope is narrowed in this Chapter for a sample of firms at Portuguese municipality level, per month, from 1995 to 2009. Thus, in the third empirical paper (in Chapter 4) the research question is as follows:

Does the introduction of reduced corporate income tax rates at regional level increases firm creation?

In this context, the main objectives of this empirical paper are to:

- assess whether firm creation increased during the period of introduction of reduced corporate income tax rates at regional level, as a consequence of the tax change;
- assess the influence of border competition on firm creation (i.e., between municipalities eligible for the tax change versus neighbouring municipalities which are non-eligible);
- assess whether job creation increased in the period of introduction of reduced corporate income tax rates at regional level, as a consequence of the tax change;
- understand the type of firms that most benefitted from the tax change (i.e., size and level of technological intensity);

- understand whether survival likelihood improved for new firms located in municipalities that benefitted from the tax change.

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2. Corporate Taxation and Financial Reporting Quality

Abstract

This paper examines whether the relation between tax enforcement and firms' financial reporting quality varies with firms' level of tax avoidance in Europe. Incentives for tax avoidance are dissimilar across firms and jurisdictions, as the latter levy firms with different corporate taxation and employ different enforcement mechanisms. Thus, the simple view that higher tax enforcement increases the quality of financial reporting may also change with institutional characteristics. We predict and confirm that in Europe, overall tax enforcement is positively associated with financial reporting quality, although there is a greater incidence for firms engaged in more tax avoidance. We find a lower sensitivity to tax enforcement for firms engaged in less tax avoidance, which is consistent with the tendency for these firms to already report higher quality financial information. Furthermore, it is unclear whether our findings are sensitive to variations in other tax system characteristics and in institutional characteristics. In contrast to other studies, we show that the association between tax enforcement and financial reporting quality is sensitive to firms' level of tax avoidance, rather than accounting for other differences at country level.

JEL classification: H26; K4; M40

Keywords: Tax Avoidance; Tax Enforcement; Financial Reporting Quality

2.1. Introduction

This study aims to understand whether the influence of countries' tax enforcement on firms' financial reporting quality varies with firms' level of tax avoidance. The study of Hanlon, Hoopes, and Shroff (2014) supports the view that tax enforcement and financial reporting quality are indirectly positively associated with the indirect effect that flows from the incentive to avoid paying taxes (what they call a 'spillover effect'). By financial reporting quality, we refer to "the accuracy with which a company's reported financials reflect its operating performance and to their usefulness for forecasting future cash flows" (Robinson., Greuning, Henry, & Broihahn, 2009, p. 724). Tax enforcement can be viewed as the effort of tax administrations to monitor, assess, and collect taxes. The spillover effect is a key assumption in Hanlon et al. (2014) study, although it is not tested, as their focus is on the quality of corporate governance, rather than on firms' level of tax avoidance. Their assumption is supported in the findings of Hoopes, Mescall, and Pittman (2012), which uses the same database, where they find evidence that tax audit probabilities in the US are negatively associated (linearly) with firms' level of tax avoidance. Furthermore, in a US-oriented study, Atwood, Drake, Myers, and Myers (2012) suggest that firms engage in less tax avoidance when tax enforcement is perceived to be stronger.

The simple view that tax enforcement mitigates tax avoidance, which in turn improves financial reporting quality (spillover effect), is not clear in the literature, especially outside the US, and should be analysed in greater depth. Hoopes et al. (2012) claim that "extant research neglects to examine the more primitive issue of whether tax enforcement disciplines firms by constraining their tax avoidance". The relation between tax enforcement and financial reporting quality might not hold for all levels of

tax avoidance. By tax avoidance, we mean "anything that reduces the firm's cash effective tax rate over a long time period" (Dyreng, Hanlon, & Maydew, 2008), which includes both legal and ilegal activities. Moreover, institutional characteristics might shape how tax enforcement influences financial reporting quality, as institutional characteristics might affect managers' incentives to produce and disclose financial information of higher quality (Chen, Tang, Jiang, & Lin, 2010).

To empirically analyse whether, and how, tax enforcement shapes firms' financial reporting quality, we exploit a dataset of 797 listed firms on the stock exchanges of 14 European countries, from 2005 to 2011. These European countries exhibit significant variations in institutional characteristics, which is in contrast to existing studies, which focus in the US, where institutional characteristics are mostly invariant between States.

We begin our analysis by confirming the positive association between tax enforcement and firms' financial reporting quality in Europe, as shown in Hanlon et al. (2014) study for the US. The effect is robust, with the inclusion of several controls at both firm level and country level. Next, we examine the role of firms' level of corporate tax avoidance, and find that the influence of tax enforcement on financial reporting quality is more prevalent in firms engaged in greater tax avoidance. Our analysis indicate that, for firms engaged in more tax avoidance, higher enforcement pressures the reporting of financial information of higher quality, in order to mitigate the detection of tax avoidance strategies. On the contrary, firms are less sensitive to tax enforcement when they are engaged in less tax avoidance. One justification is that these firms already report higher quality financial information. Following Soderstrom and Sun (2007) framework, we also examine the extent to which statutory corporate income tax rates, book-tax conformity, and countries legal origin (English common law, French

civil law, German civil law, and Scandinavian civil law) all shape differently the effect exerted by tax enforcement on financial reporting quality. These three analyses are inconclusive, and thus it is unclear whether country level characteristics across Europe shape the relation between tax enforcement and financial reporting quality. Additionally, we carry out two discriminant analyses to assess whether our findings are driven by firms misclassification into tax system characteristics (book-tax conformity) and institutional characteristics (legal origin), although we find a reasonable fit between each firm's observation and the corresponding grouping variable. We run a battery of robustness checks, which all corroborate previous findings.

This study contributes to the literature in several ways. Firstly, we predict and find that in Europe there is an overall positive relation between enforcement by tax administrations and firms' financial reporting quality. This supports findings already addressed in the literature, albeit focussed in the US (e.g., Hanlon et al. (2014)). Secondly, we provide evidence that firms' level of tax avoidance shape that relation differently. As such, this research is related to studies that examine firms' response to audit threats, in the form of warning letters which signal audit probabilities (e.g., Slemrod, Blumenthal, and Christian (2001); Wenzel and Taylor (2004); Telle (2013); Carrillo, Pomeranz, and Singhal (2014); Pomeranz, Marshall, and Castellon (2014); Castro and Scartascini (2015)). Thirdly, our study assesses whether book-tax conformity and institutional variability changes previous conclusions. Nevertheless, we fail to document a different influence on the relation between tax enforcement and financial reporting quality. This latter finding raises questions as to whether other country level characteristics matter when firms' trade-off the benefits of tax avoidance with the expected penalty of detection.

The remainder of the paper is organised as follows. The next section reviews the previous literature and introduces the research hypotheses. Section 2.3 describes the sample, variables measurement and the research design of this study. In Section 2.4 we present the empirical analysis and a battery of robustness checks. The paper ends with concluding remarks in Section 2.5.

2.2. Literature Review

2.2.1. Tax Systems and Financial Reporting Quality

In the Soderstrom and Sun (2007) framework, the influence of tax systems on accounting quality is connected to three main aspect, namely: (i) the country level of tax compliance; (ii) high statutory corporate income tax rates, and; (iii) the (close) linkage between financial accounting income and taxable income. Regarding the first aspect, theoretically, firms' tax compliance exhibits a strong relation with countries' tax enforcement. Tax authorities have legal power to verify the veracity of firms' earnings. In fact, tax administrations have a power of scrutiny that goes beyond that of the typical control mechanism of accounting regulators and minority shareholders, although they exercise no voting rights in firms (Scholes, Wolfson, Erickson, Maydew, & Shevlin, 2009, p. 3). To pursue enforcement, tax administrations not only have access to private information, but they also search for information in firms' financial statements (Bozanic, Hoopes, Thornock, & Williams, 2015). Thus, similar to accounting regulators that shape information asymmetry by imposing financial reporting, tax administrations might well also influence information asymmetry. The increase in enforcement by tax administrations should limit insiders' incentives to manage income tax payable, which indirectly influences financial reporting. Hanlon et al. (2014) predict and find that tax

enforcement in the US (measured as tax audit probability) is positively associated with firms' financial reporting quality, which is due to a spillover effect from the incentives for tax avoidance, and this effect is weaker in the presence of better corporate governance mechanisms.

Conceptually, higher enforcement by tax administrations improves firms' tax compliance (Allingham & Sandmo, 1972), which may be in the form of lower tax avoidance. A large amount of studies focus on whether, and how, tax audit probability is perceived by individuals and firms, and in general they suggest a positive response towards higher compliance on receipt of deterrence messages from the tax administration (e.g. Slemrod et al. (2001); Wenzel and Taylor (2004); Telle (2013); Carrillo et al. (2014); Pomeranz et al. (2014); Castro and Scartascini (2015)). The findings of Wenzel and Taylor (2004) shed light on the fact that mere receipt of warning letters may not achieve the perception of the higher probability of an audit, if it does not imply instructions regarding some source of self-reporting. Hanlon, Mills, and Slemrod (2007) argue that tax audit may not be perceived as sufficiently costly to increase firms' tax compliance, and it depends on firms' size. They argue that noncompliance is U-shaped with respect to scale, which means that medium-sized firms exhibit the lowest rates of noncompliance. Field experiments in Chile (Pomeranz et al., 2014) and Ecuador (Carrillo et al., 2014) also support the view that taxpayers' perceived probability of an audit increases on receipt of deterrence messages. Nevertheless, this perception is more prevalent amongst firms of a smaller size (Pomeranz et al., 2014), and furthermore firms may respond to this probability by increasing both revenue and declared costs, thus slightly changing the net revenue collectable by the tax administration (Carrillo et al., 2014). Another potential source of improvement in compliance is prior experience of

tax audits. Telle (2013) finds evidence that firms' willingness to 'cheat' appear to be substantially reduced after a tax audit. However, DeBacker, Heim, Tran, and Yuskavage (2015) findings argue that firms become more tax aggressive after a tax audit, as "firms' perceived audit risk declines as the time since audit increases". Kleven, Knudsen, Kreiner, Pedersen, and Saez (2011) suggest that both previous experience of tax audits and the current threat of receipt of an audit letter shape individuals' reporting decisions towards greater tax compliance. Moreover, compliance appears to improve when information about current and previous audit rates from the tax administration goes public (Alm, Jackson, & McKee, 2009). Slemrod et al. (2001) controlled field experiment in the State of Minnesota find out that letters sent to taxpayers increase tax payments of low-income and medium-income taxpayers, although such letters may have encouraged high-income taxpayers to report even less income, as these taxpayers perceive a positive correlation between income reported and tax audit probability. Silverman, Slemrod, and Uler (2014) point out that "how people react to authority depends on whether this authority is perceived to be legitimate". Collectively, field experiments support the view that firms comply more with increased tax enforcement, although this relation may well be non-linear. One criticism of some of these field experiments is that an individual's behaviour in a laboratory might not represent population patterns, although Alm, Bloomquist, and McKee (2015) find support for the claim that population patterns of response regarding tax compliance conform to those addressed by laboratory experiments.

High statutory corporate income tax rates are another aspect of Soderstrom and Sun (2007) framework for the link between tax systems and accounting quality. The return of tax avoidance strategies increases with higher corporate income tax rates (Desai,

Dyck, & Zingales, 2007). Gupta and Lynch (2015) demonstrate that increases in tax enforcement among the US states is positively associated with increases in tax collection, especially in states that have higher corporate income tax rates. This finding somewhat supports the view that tax enforcement is more effective when the expected returns of tax avoidance (statutory tax rates) are higher.

The firms' aim to pay lower taxes triggers the incentive to hide profits in the financial reporting process, which decreases financial reporting quality. Hanlon et al. (2014) argue that "when managers engage in tax avoidance they must conceal such actions from the tax authority". One source of tax avoidance is through profit shifting to low tax jurisdictions. Is profit shifting performed when tax rates are the same across jurisdictions? Theoretically, there are no incentives to shift profits from one jurisdiction to another if there are no differences in statutory tax rates. Nevertheless, Baumann and Friehe (2013) highlight that if "tax enforcement is less harsh" in one jurisdiction, then firms carry out profit shifting, as it allows tax avoidance in that jurisdiction. Beuselinck, Deloof, and Vanstraelen (2015) also argue that profit shifting by multinational corporations to low tax countries is more pronounced if tax enforcement is weaker in the low tax country. Lower tax enforcement relaxes the effect of the expected penalty of detection and increases the return to avoidance, which indirectly influences financial reporting.

Another major aspect regards the (close) linkage between financial accounting income and taxable income (Soderstrom & Sun, 2007). The tax literature refers to this as book-tax conformity, and it is likely to affect the quality of earnings (Guenther & Young, 2000). When book-tax conformity is high, earnings in financial reporting are used as a starting point for calculating corporate taxes. The recent debate in the US

brought to light the importance of book-tax conformity in bounding firms' tax avoidance strategies.[15] Accounting rules should be submitted to economic principles in order to show both the financial position and the economic situation of the company in an appropriate way (Soderstrom & Sun, 2007). This view is in accordance with that of accounting regulators, stock exchange commissions, and academics as well.

Recent literature suggests that increases in book-tax conformity worsens earnings' quality (e.g., Hanlon, Maydew, and Shevlin (2008); Atwood, Drake, and Myers (2010); Blaylock et al. (2015)), which supports the view of the opponents of increasing book-tax conformity, as this "will lead to a significant loss of financial information, as the information required by financial statements users and tax authorities differs significantly" (Blaylock et al., 2015). These findings contrast with those findings of proponents of increasing book-tax conformity (e.g., Desai (2005)), who argue that earnings management decreases with the increase in conformity, due to less management discretion and higher compliance. Tang (2014) demonstrates that high book-tax conformity across 32 countries is associated with lower levels of both tax avoidance and earnings management. Mills (1998) argues that increasing differences between book income and taxable income increases proposed adjustments that are derived from tax administration audits.

Gleason and Mills (2008) findings are important to recount. They find that 'beating' the target of earnings through managing tax expense triggers a modest market response (reward). Dechow, Ge, and Schrand (2010) point out a twofold interpretation of Gleason and Mills (2008) findings. On one hand, managing tax expense diminishes accounting quality, while other mechanisms, such as accruals, do not influence the

[15] See Blaylock, Gaertner, and Shevlin (2015) for a review of proponents and opponents of increasing book-tax conformity.

quality of earnings. On the other hand, managing tax expense is "a more obvious and detectable form of earnings management" (Dechow et al., 2010). Indeed, managers appear to focus on managing tax expense as a final opportunity to meet earnings' targets (Dhaliwal, Gleason, & Mills, 2004).

Regarding determinants of corporate tax avoidance, Hoopes et al. (2012) find that a higher probability of being subject to a tax audit limits firms' corporate tax avoidance in the US. They focus on the linear relation between tax enforcement (measured as tax audit probability) and tax avoidance. However, they use a graph that plots a quantile regression between tax enforcement and tax avoidance (amongst other controls) and which shows an inverted U-shaped relation between tax enforcement and tax avoidance. Moreover, Desai et al. (2007) argue that "increased tax enforcement leads to substantial organisational changes in the target companies – changes that make managerial diversion more difficult". Also regarding the determinants of corporate tax avoidance, Atwood et al. (2012) focus on three tax system characteristics: book-tax conformity; strength of tax enforcement, and; the use of a worldwide versus territorial tax system in the home country of multinationals. They find that the increase in book-tax conformity is unlikely to influence tax avoidance. An exception is found when executive compensation is in place. They suggest that the influence of tax system characteristics on firms' tax avoidance depends upon managers' incentives to avoid taxes. Atwood et al. (2012) find that firms avoid less taxes when tax enforcement is perceived to be stronger. Moreover, Kim and Zhang (2015) show that politically-connected firms are engaged in more tax avoidance than those that have no political connections, as these firms perceive lower tax enforcement. Moreover, firms in (market) competitive environments are more likely to engage in tax avoidance strategies (Cai & Liu, 2009).

Using audit data from the US tax administration, El Ghoul, Guedhami, and Pittman (2011) find that "equity financing [i.e., cost of capital] becomes cheaper when tax enforcement is tougher" as investors became more informed about the firm, and this relation is more pronounced in firms that suffer from more information asymmetry. Caballé and Dumitrescu (2015) argue that disclosing tax reports from the tax administration might be positively perceived by investors. Similarly, Kramer and Lipatov (2012) argue that "tax enforcement influences the return on shareholder funds positively unless the detection probability is very low". Desai et al. (2007) also predict that tougher tax enforcement may benefit shareholders if the decline in managers' diversion is sufficiently larger to compensate the loss of shareholders value resulting from increased tax liability. The rationale of these findings is related to the agency perspective on corporate tax avoidance, which has already been addressed in several joint studies of Mihir A. Desai, Dhammika Dharmapala, Alexander Dyck, and Luigi Zingales, amongst others, although the results might be misleading, as they are restricted to the US, which is a country with a strong agency-orientation.[16]

2.2.2. The Role of Institutional Characteristics

The dataset used in the studies of Hoopes et al. (2012) and Hanlon et al. (2014) is US-specific, and therefore it does not account for significant institutional variations, except for the State level of tax enforcement. Moreover, Hanlon et al. (2014) design their research under the agency theory framework which relies on the separation of ownership and control. One main criticism of the financial reporting literature over the

[16] In sum, the agency perspective on corporate tax avoidance suggests that tax avoidance strategies might be a mechanism for managerial opportunism and rent diversion, and thus the monitoring role of tax administrations helps to discipline managers. The traditional perspective on corporate tax avoidance argues that tax avoidance strategies are employed in the best interest of shareholders, as it is a mechanism for transferring value from the State to shareholders.

agency theory is that most studies are developed in an environment that has a strong agency-orientation, as in the case of the US. For instance, Rahman, Yammeesri, and Perera (2010) focus on a cross-country comparison between countries with significant institutional differences, such as France, Germany, Japan, Thailand and the US. They predict and find that countries' idiosyncrasies shape accounting practices, and therefore the agency theory does not fully explain variations in accounting practices outside the US. Nevertheless, Davis-Friday (2010) highlight that Rahman et al. (2010) did not account for the enforcement of accounting standards. Moreover, tax enforcement is also not taken into consideration.

For Soderstrom and Sun (2007), accounting quality is expected to vary across European countries, even after the adoption of IFRS, as legal systems vary significantly within the Union. The accounting harmonisation within Europe aimed to enhance the comparability and transparency of financial reporting, amongst other issues. Regulation No. 1606/2002, which adopted IFRS in Europe, states that the adoption of these standards was needed, as the reporting requirements to date "cannot ensure the high level of transparency and comparability of financial reporting from all publicly traded Community companies". The focus on IFRS adopters does not necessarily decrease countries variability in financial reporting, as institutional and economic factors remain dissimilar (Holthausen, 2009). In the view of Chen et al. (2010), "institutional factors construct a financial reporting environment that could directly or indirectly affect managerial incentives to produce high-quality financial information". Moreover, empirical evidence fails to consistently document an increase in transparency and cross-country comparability of financial statements with the adoption of IFRS

(Bruggemann, Hitz, & Sellhorn, 2013)[17]. For instance, Ahmed, Neel, and Wang (2013) find a decrease in accounting quality with IFRS adoption, and their findings mostly hold for countries with strong (law) enforcement. As a measure of enforcement, they use the 'rule of law' from Kaufmann, Kraay, and Mastruzzi (2011).

Ever since La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998) study, a traditional discussion in the literature is as to whether, and how, countries' legal origin plays a role in explaining cross-country differences in accounting issues. Alternative streams of literature to that of La Porta et al. (1998) exist, although that discussion is far from the scope of this study.[18] By following the framework of Soderstrom and Sun (2007), we focus on countries' legal origin, as it is expected to influence tax systems. In common law countries, "financial reporting is used to reduce information asymmetry" (Soderstrom & Sun, 2007). The research of Filip, Labelle, and Rousseau (2015) focusses on Canada, where both French civil law and English common law coexist. They find no neutrality in the legal system, which means that firms in a French civil law environment are more encouraged to report financial information of higher quality. This contrasts with most of literature on this topic, which is in line with the critics of legal-origin separation for explaining cross-country differences. For instance, Leuz, Nanda, and Wysocki (2003) study the variability of earnings across 31 countries, over a time range of 10 years, finding higher accounting quality amongst firms in common law countries and also in countries with stronger protection of shareholders rights. Spamann (2010) claims that shareholder protection is unlikely to be measured by the indexes that La Porta et al. (1998) and Djankov, McLiesh, and Shleifer (2007) use to compare

[17] Bruggemann et al. (2013) provide a detailed table that summarises the empirical evidence of some streams of financial reporting effects, such as: (i) compliance and accounting choices; (ii) accounting properties, and; (iii) value relevance.

[18] See La Porta, Lopez-De-Silanes, and Shleifer (2008) for a recent review on this topic.

common law and civil law regions. Regarding the dichotomy above, Kramer and Lipatov (2012) find that corporate tax rates exert a positive effect on shareholders' value in civil law countries, and has a negative effect in common law countries.

Jaggi and Low (2000) findings point out that measures of a country's culture, in the presence of a control for legal origin, does not explain variations in financial information provided to outsiders. Overall, they find that firms in countries with a common law tradition tend to disclose financial information of higher quality to outsiders, than when compared to firms in civil law countries. Hope (2003) also studies the role of culture and legal origin on firms' disclosure decisions, and comes to several conclusions. Firstly, somewhat in contrast with Jaggi and Low (2000), the author finds that both culture and legal origin are important in explaining financial disclosure, although these are not the main drivers of disclosure. Secondly, the importance of legal origin in explaining financial disclosure decreases as a country becomes richer. Cultural patterns also influence tax avoidance. For instance, DeBacker, Heim, and Tran (2015) use confidential data from the US tax administration to argue that tax avoidance is higher amongst those US firms where equity holders are from other countries that have significant levels of corruption.

2.2.3. Research Hypotheses

The key issue to be explored in this study is whether the influence of tax enforcement on financial reporting quality varies with firms' level of tax avoidance. The literature on field experiments suggests an increase in tax compliance arising from increased tax enforcement (e.g. Slemrod et al. (2001); Wenzel and Taylor (2004); Telle (2013); Carrillo et al. (2014); Pomeranz et al. (2014); Castro and Scartascini (2015)), which

means that tax enforcement somewhat influences incentives to avoid taxes. To set out the first research hypotheses, predictions are not expected to diverge when the traditional perspective on corporate tax avoidance is adopted, or when the agency perspective is adopted. According to the traditional perspective, if insiders and outsider shareholders are aligned in tax avoidance strategies, then such firms have an incentive to weaken financial reporting quality to a certain threshold which maximises shareholders' value creation. Weaker financial reporting quality limits the tax administration in its monitoring of its interest in firms' pre-tax earnings. An increase in tax enforcement should constraint tax avoidance, and thus is likely to exert a positive spillover effect on financial reporting quality (Hanlon et al., 2014). On the other hand, the agency perspective points out that if insiders and outsider shareholders do not collude in tax avoidance strategies, then insiders have a lower ability to lower the quality of financial reporting, in order to hide value from outsiders, including shareholders and the tax administration. According to the agency perspective on corporate tax avoidance, the tax administration complements outsider shareholders in monitoring insiders (e.g., Desai et al. (2007)), thus financial reporting quality is indeed expected to improve with higher tax enforcement. Under both theories, tax avoidance should be constrained in the presence of higher tax enforcement. Thus, is hypothesised the following:

H1: Tax enforcement is positively associated with the quality of firms' financial reporting amongst European firms.

For firms engaged in less tax avoidance, financial reporting quality is expected to be of higher quality, as there are fewer incentives to hide information from outsiders, such as the tax administration. In this context, the increase in tax enforcement should not

influence the desire to avoid taxes for these firms. Therefore, a significant influence of tax enforcement on financial reporting quality is not expected for those firms engaged in less tax avoidance. On the other hand, the incentive to report financial information of higher quality is likely to be lower amongst firms engaged in more tax avoidance. Higher financial reporting quality might offset the benefits from tax avoidance, as tax administrations gather more information to assess their priority claim over pre-tax earnings. However, tax enforcement indirectly pressurises these firms to report financial information of higher quality, as it might constraint firms' tax avoidance strategies. The second research hypothesis is stated as follows:

H2: The influence of tax enforcement on firms' financial reporting quality is higher for firms engaged in more tax avoidance.

The simple view that tax enforcement improves financial reporting quality is indeed incomplete for Europe, as it does not consider variations across countries such as in other tax system characteristics and in institutional characteristics. Firstly, country level variations in statutory corporate income tax rates exist across European countries. Secondly, the architecture of each corporate tax system is not equal, and is influenced by characteristics such as country richness in terms of per capita purchasing power (Gordon & Li, 2009), or the importance of indirect taxes for the State budget over direct taxes (Agenor & Neanidis, 2014), amongst others characteristics that go beyond tax rates. Indeed, country-level characteristics might shape this relationship, such as the dependency of tax rules on accounting rules, legal origin, and the culture of a country, to name a few. Obviously, incentives for avoiding taxes are not equal for different statutory tax burdens. Let us consider two scenarios where the level of tax enforcement is the same. Firms in countries with higher corporate income tax rates have more

incentives to avoid taxes, due to the increase in the opportunity cost if income is not diverted by insiders (Desai et al., 2007). The higher the cost (statutory tax rate), the higher the reward (incentive) from tax avoidance. If firms have more incentives to engage in tax avoidance strategies, then tax enforcement might not constraint the aim of avoiding taxes, either in the traditional perspective, or in the agency perspective on corporate tax avoidance. Thus, the influence of tax enforcement on financial reporting quality should be less in countries with a higher corporate tax burden. Nevertheless, the increase in tax enforcement may well constraint tax avoidance, which indirectly improves financial reporting quality. On the contrary, firms in countries with lower corporate income tax rates have fewer incentives to avoid taxes, and, in turn, to hide information from the tax administration. The sensitivity of these firms to tax enforcement might differ, as returns from tax avoidance are smaller. From here we propose the third research hypothesis:

H3: The influence of tax enforcement on firms' financial reporting quality varies with statutory corporate income tax rates at country level.

Next, we focus on book-tax conformity, which is one of the tax system components of Soderstrom and Sun (2007) framework that influences accounting quality, and one of the three tax system characteristics studied by Atwood et al. (2012). In countries with high book-tax conformity, strategies for avoiding taxes are likely to influence financial reporting quality. In addition to book-tax conformity, we focus on countries' legal origin, as legal systems might encourage differently the reporting of financial information of higher quality (Filip et al., 2015). Soderstrom and Sun (2007) argue that countries' legal origin shapes tax systems, which in turn indirectly influences accounting quality. The fourth and fifth research hypotheses are as follows:

H4: The influence of tax enforcement on firms' financial reporting quality is higher in countries with higher book-tax conformity.

H5: The influence of tax enforcement on firms' financial reporting quality varies with countries' legal origin.

2.3. Data and Research Design

2.3.1. Sample Selection

The firm-level sample is formed from matching two databases – Thomson Reuters Datastream, and Thomson Reuters Eikon. Sample selection starts collecting data from all listed firms on the major stock indexes of 27 European countries. The period of study runs from 2005 to 2011, covering the whole period of accounting harmonisation in Europe. Table 2.1 sets out the sample construction and composition by country. The initial sample of 2,652 firms was narrowed down after the exclusion of: financial firms; those firms with accumulated pre-tax loss over a five-year horizon; firms with no data available for all variables; countries with no data on both proxies for tax enforcement, and; observations from countries with less than five observations per year. This process ensures keeping track of each firm from 2005 to 2011. The final sample comprises 5,579 firm-year observations of 797 firms listed on the stock exchanges of 14 European countries. Sources and definitions of all variables used in this study are detailed in Table 2.2.

2.3.2. Measuring Financial Reporting Quality

Similar to Hanlon et al. (2014) study, two proxies are used to measure financial reporting quality, both of which are drawn from the accounting quality literature. The first is based on discretionary accruals, which is a modified version of Jones (1991) model, following the modifications of Dechow, Sloan, and Sweeney (1995) and Kothari, Leone, and Wasley (2005).[19] The model is as follows:

$$TA_{it} = \alpha_0 + \beta_1 \frac{1}{A_{it-1}} + \beta_2(\Delta REV_{it} - \Delta AR_{it}) + \beta_3 PPE_{it} + \beta_4 ROA_{it} + \varepsilon_{it} \quad (1)$$

TA_{it}	total accruals for firm *i* in year *t*, measured as contemporaneous earnings before taxes for each firm, minus the corresponding cash flow from operating activities
ΔREV_{it}	change in firms' revenues for firm *i*, from period *t-1* to *t*
ΔAR_{it}	change in account receivables for firm *i*, from period *t-1* to *t*
PPE_{it}	property, plant, and equipment for firm *i*, in period *t*
ROA_{it}	earnings before interest and taxes over total assets for firm *i*, in period *t*
A_{it-1}	(lagged) total assets for firm *i*, in period *t-1*

In both models, (1) and (3), lagged total assets scale all variables (A_{it-1}). The intuition to use this first proxy is as follows. Total accruals are composed by both a discretionary and a non-discretionary component. Independent variables in equation (1) control for the non-discretionary component, which is mostly related to the accruals' sensitivity to the business activity. In predicting total accruals, error term should capture managers' discretion over firms' earnings.

[19] Accrual-basis accounting refers to accounting systems where financial statements reflect transactions in the reporting period in which they occur, irrespective of the timing of cash flows. That is, firms' mostly recognise revenues when they are earned, and expenses when incurred. This often requires estimates and involves more management discretion than when compared to cash-basis accounting. Sources of discretion are: revenue recognition; depreciation choices; inventory choices; tax related choices; allowance for doubtful accounts and related provisions for lower quality debt; choices regarding goodwill and other non-current assets; stock option expense estimate, and; pension benefits choice, amongst others.

The unexplained component (residual) in each regression comprises managers' discretion over firms' accruals, which means that the component should not be influenced by business activity. That is to say, it corresponds to the component of accruals that cannot be explained by: variations in revenues and receivables; property, plant, and equipment, and; operational profitability (and cash flow from operating activities in equation 3). The measure of financial reporting quality based on discretionary accruals from the equation (1) is the following:

$$DisAccr_{it} = -100 \times |\varepsilon_{it}| \tag{2}$$

The second model focus on accruals' quality – sometimes labelled as working capital accruals – which was developed by Dechow and Dichev (2002), and we use the modified version presented by Hope, Thomas, and Vyas (2013):

$$\begin{aligned} WCA_{it} = {} & \alpha_0 + \beta_1 CFO_{it-1} + \beta_2 CFO_{it} + \beta_3 CFO_{it+1} + \beta_4 \Delta REV_{it} \\ & + \beta_5 PPE_t + \beta_6 DCFO_{it} + \beta_7 (DCFO_{it} \times CFO_{it}) + \epsilon_{it} \end{aligned} \tag{3}$$

WCA_{it} working capital accruals measured as change in non-cash current assets, minus change in current liabilities, and minus the change in short-term debt, for firm *i*, in period *t*

$CFO_{it\pm b}$ lagged, contemporaneous, and future cash flow from operating activities, for firm *i*

$DCFO_{it}$ a dummy variable taking the value one if *CFO* is negative for firm *i*, in period *t*

This second model contrasts financial statement prepared on a cash basis with those financial statements prepared on an accrual basis. It also allows for the identification of the extent to which discretion is embedded in reported financial statements.

Likewise, the measure of financial reporting quality based on accruals quality (equation 3) employed in this research is the following:

$$AccrQuality_{it} = -100 \times |\epsilon_{it}| \tag{4}$$

Higher absolute values of residuals mean higher discretion and lower financial reporting quality. The absolute value of residuals is multiplied by -100, to make interpretation easier – a higher *DisAccr* or *AccrQuality* means higher financial reporting quality.

2.3.3. Measuring Tax Enforcement

Tax enforcement measures the effort of the tax administration in monitoring, assessing, and collecting taxes. Enforcement by the tax administration would preferably be measured at firm level, although it is hard to obtain comprehensive data directly from each tax administration. Consequently, tax enforcement is difficult to quantify (Desai et al., 2007). Data is obtained from the OECD Tax Administration Database. The OECD gathers information on taxation at country level. The *Cost of Collection* ratio is used as a proxy for tax enforcement, being the ratio of the administrative costs of the tax administration over net revenue collected. This proxy is used in other studies such as that of Agenor and Neanidis (2014), in which they simulate a model to maximise growth and tax revenue, using tax enforcement (countries' tax collection costs from the OECD) and the optimal level of indirect over direct tax revenues from 41 countries. One potential criticism of this measure is that tax administrations' enforcement is also a function of tax codes' complexity and countries' level of tax evasion (i.e., illegal means of reducing corporate tax liability). This is a reasonable criticism, as in countries where firms evade taxes less, there is less incentive for tax administrations to enforce more.

Another proxy for tax enforcement, also arising from the OECD database, is the portion of full time equivalent (FTE) tax administration staff in functions of verification and tax debt collection over all FTE staff working for the tax administration (*Staff*).

Hanlon et al. (2014) use the number of permanent employees of the US tax administration as additional measure of tax enforcement, which corroborate their main findings. *Staff* is only available in our sample for 13 countries, and just for the year 2011. While our first proxy for tax enforcement captures to some degree the efficiency to generate net revenue, the second proxy focusses on the human resources allocated to activities that imply efforts for collection, such as tax audits.

2.3.4. Measuring Tax Avoidance

The long-run cash effective tax rate (*LCETR*) is our preferred proxy for tax avoidance, as it captures tax avoidance strategies in the long-run, rather than in just one year (Dyreng et al., 2008). *LCETR* is measured as the sum of cash tax paid over a five-year horizon, divided by pre-tax earnings over the same period. Lower *LCETR* means that firms exhibit higher tax avoidance. *LCETR* is widely used in the literature, and might well be more appropriate than other measures due to lower measurement errors, although there are some concerns about using this proxy over a time lag of five years. The problem is that data from before IFRS adoption in 2005 are adjusted in the databases for changes from domestic to international accounting standards. The cash effective tax rate (*CETR*) is used for robustness, which measures the cash tax paid each period over the corresponding pre-tax earnings. One concern is that *LCETR* might not capture the 'true' level of tax avoidance within a country, because statutory corporate income tax rates (*CITR*) varies between countries. Therefore, a ratio between *LCETR* and *CITR* is also included for robustness – *LCETR*/*CITR*.

2.3.5. Research Design

In this section we describe our research design. To understand the relation between tax enforcement and financial reporting quality (*FRQ*), the following equation is used, through an ordinary least square approach:

$$FRQ_{ict} = \beta_0 + \beta_1 Tax\ Enforcement_{ct} + \beta_2 lnMVE_{it} + \beta_3 SD\ CFO_{it} + \beta_4 SD\ Sales_{it} + \beta_5 Leverage_{it} + \beta_6 CI_{it} + \beta_7 II_{it} + \beta_8 PI_{it} + \beta_9 Trust_{ct} + \sum_{c=1}^{14} Y_c + \sum_{t=1}^{7} \delta_t + \varepsilon_{ict} \quad (5)$$

The dependent variable *FRQ*, either *DisAccr* or *AccrQuality*, proxies for financial reporting quality per firm *i*, located in a country *c*, for the year *t*. As previously mentioned, it is hypothesised that these variables are influenced by country level of tax enforcement, as well as other tax system characteristics and institutional characteristics. We use either *Cost of Collection* or *Staff* as proxies for tax enforcement. Consistent with earlier empirical evidence for the US, we predict a positive association between tax enforcement and financial reporting quality (measured by the coefficient β_1), which indicates that higher enforcement by tax administrations improves the quality of firms' financial reporting (H1). Several firm's controls are also included (see Table 2.2 for detailed description), and interaction terms are added to equation (5), in order to help answering the second, third, and fourth research hypotheses.

As firms increase in size (*lnMVE*), they are more likely to be followed by analysts and institutional investors, which raises more potential controlling forces. We expect a positive influence of *lnMVE* on financial reporting quality. On the other hand, as *Leverage* increases, informational focus somewhat shifts from investors to creditors, who demand a different focus in financial reporting. Financial reporting quality variability might be a consequence of variations in its fundamental drivers, and thus we

control for variability in sales (*SD Sales*) and in cash flows from operating activities (*SD CFO*). Higher volatility is expected to lower financial reporting quality, as it increases discretion – which is a negative signal. *Capital Intensity* (*CI*) and *Intangibles Intensity* (*II*) are likely to explain variability in financial reporting quality, as these balance sheet items are highly subject to managers' discretion.

To control for omitted country-level factors, we use a fixed effect specification for country and year. The measure of culture of a country (*Trust* in politicians) is the only control at country level used in the base estimation. Robinson and Slemrod (2012) use several tax systems determinants (economic variables, political variables, and cultural variables) and find that the *Trust* in politicians' cultural variable is the most consistent determinant of the variability in tax systems across countries. In the presence of the fixed effect specification for country and year, the inclusion of other country level controls showed undesired multicollinearity, as we restrict variations on the outcome to that within the country and year. To overcome this issue, other country level variables are included for robustness. Nevertheless, following Soderstrom and Sun (2007) framework, more in-depth analyses with other country level characteristics are performed – specifically, *statutory corporate income tax rates*, *book-tax conformity*, and *legal origin*.

An important issue is as to whether firms are properly classified in the sample, in accordance with countries' book-tax conformity and legal origin. Considering the current global tax competition, some firms decide to move their headquarters to lower tax jurisdictions, amongst other tax avoidance strategies. Therefore, some firms might be listed on stock exchanges of countries that are different from the countries where the

firm's business is operated and its effective management is located.[20] Consequently, the role of other tax system characteristics and institutional characteristics on financial reporting might be misrepresented for several firms on account of these strategies.

Discriminant analysis can be used to understand whether firms in each country exhibit patterns that can be classified in each grouping variable. Firstly, as our aim is to describe group differences and to predict a group membership for each observation. Secondly, as group units are known in advance. That is to say, the classification of each firm in each grouping variable is defined in the literature, and obtaining such classification is not a primary goal of this study. This is a major difference to other techniques that search for the grouping of variables, such as factorial analysis. One grouping variable is book-tax conformity, in which the variable takes the value one for quasi-dependent tax regimes (high book-tax conformity), and zero for countries that have independency between tax rules and accounting rules for determining taxable income (low book-tax conformity). Thus, the first canonical linear discriminant function is as follows:

$$\omega_1 = \beta_1 LCETR + \beta_2 CITR + \beta_3 DT + \beta_4 Trust + \beta_5 Tax\ Enforcement \qquad (6)$$

where the discriminant function (ω_1) predicts observation classification in specific grouping variable. As controls, both tax measures and a control for a culture of the country are included. Specifically, as tax measures we include both a proxy for tax avoidance (*LCETR*), and others that captures statutory corporate income tax rates (*CITR*), firms deferred tax scaled by pre-tax earnings (*DT*), a cultural variable (*Trust*), and a proxy for tax enforcement (either *Cost of Collection* or *Staff*).

[20] For instance, the recent 'tax inversion' movement in the US of shifting firms' domicile to low tax countries through mergers and acquisitions. Terex Corp., merged with a Finnish based firm (Konecranes Plc) to move its domicile there. Cyberonics Inc. targeted a firm based in Italy (Sorin SpA) to relocate its location to the UK (The Economist, 2015, pp. 56-57).

The second grouping variable is countries' legal origin, whose canonical linear discriminant function is as follows:

$$\omega_2 = \beta_1 lnMVE + \beta_2 Leverage + \beta_3 Tax\ Enforcement \quad (7)$$

in which the discriminant function (ω_2) predicts observation classification into each countries legal origin, namely: English, French, German, or Scandinavian. As controls we used the measures of: (i) market capitalisation; (ii) firms' financial leverage, and; (iii) tax enforcement. Market capitalisation and leverage are used, as one stream of literature claims that the strength of financial markets and the structure of corporate ownership are influenced by countries' legal origin.

2.3.6. Descriptive Statistics

Table 2.3 provides summary statistics for variables used in the empirical models. *DisAccr* and *AccrQuality* means are -0.046 and -0.036, respectively, and both variables present relevant standard deviation (0.046 and 0.042). Overall, the mean (median) *Cost of Collection* ratio in the sample is 1.08 (1.08), and it varies from 0.38 to 3.04. The *Staff* mean (median) in the sample is 0.44 (0.41), which means that approximately 44% of tax administrations' FTE staff are allocated to enforcement activities, and this ratio varies from 0.257 to 0.803. The mean (median) *LCETR* of the firms is 0.31 (0.29), which means that firms' cash outflows to the tax administration over a five-years horizon is approximately 31% of the corresponding pre-tax earnings. The majority of firms in the sample (71%) are listed in countries classified as having high book-tax conformity.

Table 2.4 presents the basic descriptive statistic by country for the most relevant variables. Firms exhibiting lower financial reporting quality are mostly located in Poland, Ireland, and Hungary. These three countries present a lower (mean) statutory

corporate income tax rate, although they differ significantly with regards to tax enforcement, book-tax conformity, and legal origin. Those countries with a lower *Cost of Collection* ratio are Sweden and Denmark, and those on the opposite side are Poland and Germany. In order to better understand the distribution of the *Cost of Collection* ratio, a graphical analysis in Figure 2.1 suggests significant variations by country, in which Poland shows a higher variability from 2005 to 2011 from amongst all the countries in the sample. The *Cost of Collection* ratio in Poland was 1.94 in 2005, and it grew to 3.04 in 2010, due to a significant increase in the costs of the tax administration, rather than from variation in tax revenues. France and Sweden are the two countries with the lowest values for *Staff*. Conversely, Denmark and Austria allocate more FTE staff to verification and tax debt collection functions. About 54.0% of the sample is composed of firms listed in countries with a French legal origin, whilst 23.8%, 20.8% and 1.4% of the sample relate to the German, Scandinavian and English legal origin, respectively.

Table 2.5 present coefficients of the pairwise Pearson correlation between our main variables. As expected, *DisAccr* and *AccrQuality* are positively correlated (correlation 0.351; t-stat 27.95; p-value 0.00). *Cost of Collection* and *Staff* are negatively correlated (correlation -0.197; t-stat -14.68; p-value 0.00), although this is not a significant issue as these variables are used in separate models. Moreover, the correlation is calculated using data on *Staff* for just one year, while we use data on *Cost of Collection* from 2005 through to 2011. *LCETR* is not correlated with both proxies for financial reporting quality, whilst correlated with both proxies for tax enforcement.

2.4. Empirical Results

2.4.1. Tax Enforcement and Financial Reporting Quality

This paper first examines in Table 2.6 the association between tax enforcement and firms' financial reporting quality, with the estimation of equation (5). To test the first research hypothesis in columns (1) through to (4), estimations use two proxies to measure financial reporting quality, and two proxies to measure enforcement by tax administrations. Columns (1) and (2) correspond to estimates using the two proxies of tax enforcement when financial reporting quality is set out by *DisAccr*, while columns (3) and (4) use the two proxies of tax enforcement when the dependent variable is *AccrQuality*. In columns (2) and (4), the sample is narrowed to a cross-section analysis, as data to perform equation (5) with *Staff* for more than one period is lacking. Results indicate a significantly positive association between tax enforcement and firms' financial reporting quality, which provides strong support for the first research hypothesis. The positive signal means that firms' financial reporting quality is improved with higher enforcement by tax administrations. That is to say, as tax enforcement increases, managers' discretion in financial reporting decreases.

Financial reporting quality is higher for large-sized firms, measured by its logarithmic of market value of equity. Larger firms typically have more stakeholders to whom accounting information is needed to be provided, especially qualified investors and analysts. On the other hand, more variability in sales and in cash flow from operating activities makes financial reporting less predictable, and thus they exert a negative effect on the quality of financial reporting. The intensity of intangibles in each firm is an indicator of increased space for managers' discretion. Intangibles are volatile per nature, and in some situations they are measured in firms' accounts based on

subjective information, as assets are not physical by nature. This subjectivity might misrepresent reported financial information. More leveraged firms may prepare financial information to satisfy the reporting needs of creditors which may compromise the quality of information provided to their shareholders. Thus, in our estimations, it is reasonable that more leveraged firms' are associated with lower financial reporting quality.

2.4.2. The Role of Firms' Level of Tax Avoidance and Statutory Tax Rates

In the research hypotheses section it was stated that the relation between tax enforcement and financial reporting quality should take into consideration firms' incentives to avoid paying taxes. The role of firms' level of tax avoidance in the relation between tax enforcement and financial reporting quality is analysed in Table 2.7, and this relation is further re-examined in Table 2.9, with focus on statutory corporate income tax rates. In columns (1), (4), (7), and (10), the interaction effect of the tax rate (effective or statutory) over tax enforcement is included, while in other columns, the sample is split into two parts by the median of the proxy for tax rate. For parsimony, hereafter only the coefficient of tax enforcement, tax avoidance, and its interactions is reported, if there is any.

If tax avoidance creates friction in firms' information environment, then a higher effect of tax enforcement on financial reporting quality in the presence of higher tax avoidance is expected. The positive relation between tax enforcement and financial reporting quality remains positive with the inclusion of an interaction term in columns 1, 4, 7, and 10 of Table 2.7. However, it is inconclusive as to whether there is higher influence on financial reporting quality which is dependent on the level of tax

avoidance. We find support in favour of the second research hypothesis, using subsamples of different levels of tax avoidance. The coefficient of tax enforcement is significantly positive in all samples composed of firms with lower *LCETR* (columns 3, 6, 9, and 12), whilst it is not significant, or significantly negative, in samples of firms with higher *LCETR*.

Collectively, the results in Table 2.7 suggest that tax avoidance is a mechanism through which tax enforcement influences firms' financial reporting quality, although there is a greater incidence for firms engaged in more tax avoidance. An increase in the expected penalty of detection due to higher tax enforcement might drive this result. Moreover, tax enforcement does not appear to influence financial reporting quality for less-tax avoiding firms. In this case, there is no spillover effect of tax enforcement on financial reporting quality through firms' level of tax avoidance. One justification is that firms engaged in less tax avoidance already report high quality financial information. Table 2.8 shows the mean sample comparison between firms classified according to different levels of tax avoidance. For all proxies of corporate tax avoidance, financial reporting quality is higher for firms engaged in less tax avoidance, which confirms the justification noted above.

The results in Table 2.9, using an *ex-ante* corporate tax burden, provide some support for the third research hypotheses in the cross-section estimation using *Staff* as proxy for tax enforcement (columns 4 to 6 and 10 to 12). When statutory tax rates (*CITR*) are already low, firms appear to exhibit higher quality of financial reporting in the presence of higher enforcement. Unfortunately, our results are not definitive when using the preferred proxy for tax enforcement for a time range of between 2005 and 2011 (columns 1 to 3 and 7 to 9). Therefore we cannot support the hypothesis that the

influence of country level of tax enforcement on firms' financial reporting quality varies with country level statutory corporate income tax rates.

2.4.3. The Role of Other Tax System Characteristics and Institutional Characteristics

The purpose of this section is to examine whether the relations previously analysed vary with other countries specific characteristics (H4 and H5). The degree of dependence of tax rules on accounting rules for determining taxable profit is set as book-tax conformity (*BTC*), which distinguishes countries with quasi-dependent tax regimes (*high BTC*), and countries with independent tax regimes (*low BTC*). Table 2.10 summarises the book-tax conformity analysis. The predictions are that countries with a close linkage between tax rules and accounting rules (*high BTC*) should exhibit a higher influence of country level tax enforcement on firms' financial reporting quality. Contrary to our expectations, results on the fourth research hypothesis are inconclusive, even when using interaction terms, or when splitting the sample into two parts (*high BTC* versus *low BTC*). Thus, book-tax conformity in Europe appears to be a characteristic of a third order of importance for shaping the relation between tax enforcement and firms' financial reporting quality.

The previous analysis was developed using an important assumption – that tax system characteristics (i.e., *BTC*) shape the relation between tax enforcement and financial reporting quality. The classification between high and low book-tax conformity is set by the literature, although it might not fit into sample characteristics. The next approach is to perform a discriminant analysis, to examine whether each observation is properly classified into country-level characteristics. Table 2.11 details the discriminant analysis for book-tax conformity. The first two columns use data from

2005 to 2011, while the last three columns focus on book-tax conformity in 2011. Estimated coefficients are reported in Panel A, followed by model statistics in Panel B. Panel C summarises the percentage and number of observations that are correctly classified in each grouping variable. Type 1 and Type 2 errors can be easily understood in each discriminant analysis, through the off-diagonal elements in Panel C. Overall, the percentage of accuracy in predicting firms' classification into each group of book-tax conformity (*high BTC* versus *low BTC*) ranges from 62.6% to 93.7%. This is often named as 'hit ratio', and it shows the "proportion of correct classifications across all subpopulations" (Huberty, 1994, p. 84). The chance of correct classification by book-tax conformity is just 62.6% in the cross-section analysis in Model (5), where *Staff* is included as a proxy for tax enforcement. When considering *Cost of Collection* ratio as proxy for tax enforcement, a range of 91.9% – 93.7% observations can be correctly predicted. Moreover, some predictors are more relevant for explaining grouping variable classification. Those predictors that are more correlated with the discriminant function in all models are: *Cost of Collection* ratio, and the cultural variable *Trust*. This contrasts with the univariate analysis in Table 2.5, as the signal is contrary, albeit significant. The *F*-test is used to examine the significance of models as a whole, and all models show statistical significance. Therefore, the previous conclusions are unlikely to be driven by misclassification into the groups of high or low book-tax conformity.

Hanlon et al. (2014) claim that the relation between tax enforcement and financial reporting quality might "depends on country level institutions", such as the Securities and Exchange Commission (SEC) in the US. To extend the analysis regarding institutional characteristics, in Table 2.12 the sample is split into four parts, by

countries' legal origin – English, French, German, or Scandinavian. We run model in equation (5) for each combination of proxies for tax enforcement and for financial reporting quality. However, there is not enough data to perform tests in columns (8) and (16). Focussing on legal origin as institutional characteristic, the results are inconclusive (H5). The discriminant analysis for legal origin is presented in Table 2.13. Four different models are tested, using different time ranges and predictors. The overall percentage of accuracy in predicting firms' proper classification into each countries legal origin ranges between 66.7% and 84.2%, although the classification is not robust for firms in English common law and in German civil law countries. Discriminant analysis highlights the fact that previous conclusions might not be driven by the misclassification of each firm into grouping variables in French and Scandinavian civil law.

2.4.4. Robustness Checks

We conduct several sensitivity analyses to assess the robustness of our findings. Firstly, we recognise that other country level characteristics might play a role in explaining the relation of tax enforcement on financial reporting quality, rather than trust in politicians, book-tax conformity, and legal origin, the latter two being set out in the Soderstrom and Sun (2007) framework. Moreover, countries could be categorised into institutional clusters in terms of reporting practices (Leuz, 2010). Thus, in the first set of robustness checks, the analysis conducted in Table 2.6 is repeated, but this time redefining country level controls. The literature suggest that outsiders' rights mitigate insiders' incentives for earnings management (Leuz et al., 2003), thus an index of *Creditor Rights* at country level from Djankov et al. (2007) study is introduced, despite the critiques of this measure (e.g., Spamann (2010)). Another feature studied in the

literature, is the relation between accounting quality and the development of capital markets (see Soderstrom and Sun (2007) framework). Thus, a control for *Financial Development* is introduced, which is measured as stock market capitalisation as a percentage of GDP. The literature also points out that, similar to tax avoidance, the degree of *Tax Evasion* shapes firms' reporting decisions (e.g., Kleven et al. (2011) and Telle (2013)). A proxy for tax evasion at country level is indeed included as robustness. The influence is intuitive, as tax evasion and tax avoidance are hard to distinguish. As an additional test, a factor score is used which combines the following country level variables: *Trust*, *Creditor Rights*, *Financial Development*, and *Tax Evasion*. Moreover, tax rates are not the only tax system component varying across countries. Tax aspects that are non-tax rate differ significantly (Robinson & Slemrod, 2012). Therefore, is included the *Dispersed Responsibility Index* of Robinson and Slemrod (2012) that combines 10 tax system measures (other than tax rates), except the variable that proxies for the maximum penalty for failure to correctly reported tax liability. This exclusion is required due to missing data for Poland, although index properties are not significantly changeable. The index obtained by us with the same procedure of Robinson and Slemrod (2012), but using 9 of the 10 tax system measures, exhibits very strong correlation with the index originally computed by the authors (correlation 0.993; t-stat 211.6; p-value 0.00). With the inclusion of all robustness checks described above, the results presented in Table 2.6 and Table 2.7 remain strong. Regression outputs are not reported, as their results are very similar.

Chen et al. (2010) test whether institutional factors affect managers' incentives for financial reporting. They perform several tests, using a set of worldwide governance indicators from Kaufmann et al. (2011) study. These institutional factors (*VAI*, *PVI*,

GEI, *RQI*, *RLI*, *CCI*, and *WGI*) aim to capture those characteristics that shape managers' incentives for financial reporting, and they are pooled by country and by year. In Table 2.14 is included these country level controls that were not conclusive in Chen et al. (2010) in explaining financial reporting quality improvement with the IFRS adoption. Data on these variables is obtained directly from The World Bank, and are detailed in Table 2.2. In line with Chen et al. (2010) conclusions, Table 2.14 shows that most of these controls are not statistically significant and that they do not change previous conclusions.

Jaggi and Low (2000) and Hope (2003) diverge as to whehter both culture and legal origin play a role in explaining variations in firms' financial reporting. An interaction term between countries legal origin and the measure of culture is added to model in equation (5) – *Trust*. Results are unchanged.

Misclassification regarding book-tax conformity might influence our results. For instance, Germany is classified in the sample as a country with low book-tax conformity, although some studies classify this country as having high book-tax conformity. For instance, Goncharov and Werner (2009) claim that Atwood et al. (2010) "find that book-tax conformity in Germany tends to be low while conventional wisdom suggests that it is high". Therefore, the analysis in Table 2.10 is repeated, with a reclassification of German firms into the group of higher book-tax conformity. Results obtained are similar to those of Table 2.10, which means that book-tax conformity appears to be a characteristic of a third order of importance to understand the relation between countries tax enforcement and firms' financial reporting quality.

As a further robustness check, firms listed in the Polish stock exchange are excluded from the sample, as Poland exhibits significantly variations across time for tax

enforcement, when proxied by the *Cost of Collection* ratio. Results in Table 2.6 remain robust after excluding these observations, except in column (3), where the tax enforcement coefficient is positive, but not significant at conventional levels.

To further examine the robustness of the results, in Table 2.15 we evaluate whether the indirect effect that we observe in Table 2.7 between tax enforcement and financial reporting quality (through the firms' level of tax avoidance) holds when we replace *LCETR* with alternative proxies. The cash effective tax rate (*CETR*) for each period is not biased on dataset adjustments prior to 2005, although it has other caveats. For instance, this variable exhibits higher volatility over time for each firm, when compared to the preferred measure of tax avoidance – *LCETR*. As *LCETR* may not capture the 'true' level of tax avoidance within a country, *LCETR* is scaled by the corresponding statutory corporate income tax rate (*CITR*) – *LCETR*/*CITR*. Table 2.15 presents results of these tests. Using *CETR* as a proxy for tax avoidance does not address robust results in all estimations, although results remain robust using *LCETR* scaled by *CITR*, as predicted in H2.

In the final robustness check, in Panel A, of Table 2.16 a firm-fixed effects specification is considered to address a major concern: whether financial reporting quality is endogenous due to the omission of firm level characteristics. Gaio (2010), in a worldwide study before IFRS adoption in Europe, suggests that firm and industry characteristics are more relevant for explaining earnings quality variability than country characteristics. Therefore, we restrict variations on financial reporting quality to that within the firm and year. The cross-section setting using *Staff* to proxy for tax enforcement is not computable, due to strong multicollinearity. By replacing the country and the year fixed effect specification by a fixed specification at firm level and by year,

coefficients remain positive and statistically significant in the panel regression, using the *Cost of Collection* ratio as a proxy for tax enforcement. In panel B of Table 2.16 we test whether either a fixed or a random effect specification are appropriate for controlling for those omitted variables that might affect the economic consequences of tax enforcement. Despite the Hausman test recommending using the fixed-effect specification (as performed in Panel A, of Table 2.16), our estimations spread robust results using either fixed or random specification for firms and year.

2.5. Conclusions

In this paper we investigate the role played by tax avoidance on the relation between enforcement by tax administrations, and firms' financial reporting quality in Europe. Hypotheses are tested on a sample of 5,579 firm-year observations, from 14 European countries, between 2005 and 2011. We begin by confirming the previous findings from the US that tax enforcement is positively associated with financial reporting quality (Hanlon et al., 2014). Further analysis reveals that tax enforcement improves financial reporting quality, although it is more prevalent in firms that avoid paying more taxes. We address two complementary interpretations for this finding. Firstly, greater enforcement by the tax administration increases the expectation of the penalty of detection, which in turn disincentives the misreporting of financial information. Secondly, firms engaged in less tax avoidance do not respond to higher tax enforcement, as they already report high quality financial information. Indeed, their response to tax enforcement is weaker, as they evade less. Next, the role of statutory corporate income tax rates per country and year is examined, and we find only weak significance. It is unclear whether the influence of country level of tax enforcement on

firms' financial reporting quality varies with country level statutory corporate income tax rates. The final set of tests employs the analysis of those other tax system characteristics and institutional characteristics that might influence our results, such as book-tax conformity, and legal origin. Both follow Soderstrom and Sun (2007) framework, although results are inconclusive. We run a battery of robustness checks, including for the institutional setting, and also alternative proxies for measuring corporate tax avoidance, and these tests corroborate our findings.

Our findings make several contributions to the literature. Firstly, we predict and find an overall positive relation between enforcement by tax administrations and firms' financial reporting quality, in a European-oriented study. This supports findings already addressed in the literature which is focussed in the US. Secondly, we extend the current literature by showing that firms' level of tax avoidance shapes this relationship differently. Whereas the previous literature on this topic has not considered firms' practices of tax avoidance, our paper examines this unexplored setting, together with a cross-country analysis, and it provides nuances regarding what was tested in the literature to date. Firms that already pay high corporate taxes are less sensitive (or even insensitive) to tax enforcement. This contributes to the growing amount of literature that focusses on firms' response to tax audit threats (e.g., Slemrod et al. (2001); Wenzel and Taylor (2004); Telle (2013); Pomeranz et al. (2014); Carrillo et al. (2014); Castro and Scartascini (2015)). Finally, this study focusses on an environment that has significant tax systems and institutional variability, which might well change the previous conclusions drawn from the US studies. Nevertheless, we fail to document a different influence on the relation between tax enforcement and financial reporting quality. This finding raises questions as to whether differences in institutional characteristics really

matter in explaining financial reporting quality, when firms trade-off the benefits of tax avoidance with the expected penalty of detection.

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Appendix A. Tables and Figures

Table 2.1: Number of firms by country (2005 through to 2011)

Code	Country	Firms	Sample
AT	Austria	22	154
BE	Belgium	34	238
DK	Denmark	38	266
FI	Finland	55	385
FR	France	212	1,484
DE	Germany	147	1,029
HU	Hungary	7	49
IE	Ireland	11	77
IT	Italy	73	511
NL	the Netherlands	49	343
PL	Poland	14	98
PT	Portugal	16	112
ES	Spain	46	322
SE	Sweden	73	511
	Total	797	5,579

Sample construction	
Initial Sample (unbalanced)	18,564
Countries	27
Excluded:	
Financial firms	1,144
Negative/missing pre-tax income	5,240
Not enough data to calculate all control variables for each firm *i* and period *t*	5,817
Missing data at country level *c*	784
Final sample (balanced)	5,579
Countries	14
Discretionary Accruals	5,579
Accruals Quality	5,579

Notes:

Excluded: Bulgaria, Cyprus, Czech Republic, Estonia, Greece, Latvia, Lithuania, Luxembourg, Malta, Norway, Romania, Slovakia, Slovenia, and the United Kingdom.

There is no data for Belgium when *Staff* proxies for tax enforcement.

Table 2.2: Data and variable construction

Variable	Source	Definition
Financial Reporting Quality		
DisAccr	–	Discretionary accruals based on the Jones (1991) model, with Dechow et al. (1995) and Kothari et al. (2005) adjustments, as detailed in Section 2.3.2.
AccrQuality	–	Accruals quality developed by Dechow and Dichev (2002), with the complement suggested by Hope et al. (2013), as detailed in Section 2.3.2.
Tax Enforcement		
Cost of Collection	b	Cost of collection ratio, measured as administrative costs of tax administrations as a portion of net revenue collected, by year.
Staff (verification and tax debt collection)	b	Staff – measures the total staff usage for functions of verification and tax debt collection as a portion of all FTE staff for all tax functions and support, for the year 2011.
Tax Rates		
LCETR	a	Long-run cash effective tax rate, measured as the sum of cash tax paid over a five-year horizon, divided by pre-tax earnings over the same period. *LCETR* is winsorized at 1% and 99%.
CETR	a	Cash effective tax rate, measured as cash tax paid over pre-tax earnings. *CETR* is winsorized at 1% and 99%.
CITR	d	Statutory corporate income tax rate by country *c*, and year *t*.
LCETR/CITR	a-d	*LCETR* scaled by *CITR* over the same period (five-year horizon).
Firm level controls		
lnMVE	a	Log of market value of equity.
SD CFO	a	The standard deviation of the three prior years' cash flow from operations, scaled by total assets in period *t*.
SD Sales	a	The standard deviation of the three prior years' sales, scaled by total assets in period *t*.
Leverage	a	Financial leverage, measured as long-term debt over lagged total assets.
Capital Intensity	a	Capital intensity, measured as net property, plant, and equipment (PPE), scaled by lagged total assets.
Intangibles Intensity	a	Intangibles intensity, measured as research and development expenses as a portion of current sales. If research and development expenses are missing, it is coded as zero.
Presence of Intangibles	a	Presence of intangibles. Captures firms with no intangibles. Specifically, it is a dummy variable, taking the value 1 if *Intangibles Intensity* is 0, and 0 otherwise.
DT	a	Deferred taxes, measured as firms' contemporaneous deferred taxes over pre-tax earnings.
Country level controls		
Trust	e	Cultural variable related to trust in politicians, as used by Robinson and Slemrod (2012). Survey question: "*Public trust in the financial honesty of politicians*", 1 is very low, and 7 is very high.
Book-Tax Conformity (*BTC*)	c	Type of tax regime. This variable measures the degree of dependence of tax rules on accounting rules for determining taxable profit. The variable takes the value 1 for quasi-dependent tax regimes (high book-tax conformity), and 0 for independent tax regimes (low book-tax conformity).
Legal Origin	–	Legal Origin from La Porta et al. (1998). Equals 1 if the origin is English common law; 2 if the origin is French civil law; 3 if the origin is German civil law, and; 4 if the origin is Scandinavian civil law.
Creditor Rights	–	Country index of creditor rights from Djankov et al. (2007). The index is for 2002, and ranges from 0 to 4. Higher values indicate stronger creditor

		protection.
Financial Development	f	Financial development, measured as stock market capitalisation over gross domestic product (GDP), originally compiled by Beck, Demirguc-Kunt, and Levine (2000).
Tax Evasion	g	Size and development of tax evasion as a percent of GDP, as in Buehn and Schneider (2012).
Dispersed Responsibility Index	–	The Dispersed Responsibility Index is developed by Robinson and Slemrod (2012), and is the principal factor retained from a factor analysis of 10 (standardised) tax system measures that are non-tax rate and are based on reports published by the OECD. All 10 variables measure a specific feature of countries' tax systems. Specifically, it includes five enforcement measures and five procedural measures. Both groups of measures comprise features that apply directly, or indirectly, to most of all taxpayers. Is only included four of the five procedural measures, owing to the lack of data for Poland on the measure of the maximum penalty for failure to correctly reported tax liability.
VAI	f	Voice and Accountability. Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
PVI	f	Political Stability and Absence of Violence/Terrorism. Reflects perceptions of the likelihood that the government will be destabilised, or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.
GEI	f	Government Effectiveness. Reflects perceptions of the quality of public services, the quality of the civil service, and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
RQI	f	Regulatory Quality. Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
RLI	f	Rule of Law. Reflects perceptions of the extent to which agents have confidence in, and abide, by the rules of society, and in particular, the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
CCI	f	Control of Corruption. Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as the "capture" of the State by elites and private interests.
WGI	f	Worldwide Governance Index, measured as the principal component from the principal component analysis of *VAI*, *PVI*, *GEI*, *RQI*, *RLI*, and *CCI*. The index is computed by country.
i	–	Firm.
c	–	Country where the firm is listed.
t	–	Year of Data.

[a] Thomson Reuters DataStream / Eikon;

[b] OECD Tax Administration Database;

[c] PwC – IFRS adoption by country, 2013, PricewaterhouseCoopers;

[d] KPMG available online at: http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/ (Tax tools & resources);

[e] The Global Competitiveness Report (WEF – World Economic Forum);

[f] The World Bank. The Worldwide Governance Indicators (*VAI*, *PVI*, *GEI*, *RQI*, *RLI*, *CCI*, and *WGI*) were initially developed by Kaufmann et al. (2011). These indicators range from approximately -2.5 (weak) to 2.5 (strong) governance performance, except for *WGI*;

[g] The Organisation for Economic Co-operation and Development (OECD).

Table 2.3: Descriptive statistics by variable

Variable	No.	Mean	Standard Deviation	1st Quartile	Median	3rd Quartile
PANEL A: Measures of FRQ						
DisAccr	5,579	-0.046	0.046	-0.060	-0.031	-0.014
AccrQuality	5,579	-0.036	0.042	-0.046	-0.023	-0.010
PANEL B: Tax Measures						
Cost of Collection	98	1.079	0.435	0.780	1.080	1.310
Staff	13	0.443	0.131	0.389	0.405	0.483
LCETR	5,579	0.305	0.193	0.214	0.293	0.363
CETR	5,579	0.324	0.286	0.175	0.278	0.368
CITR	98	0.264	0.067	0.250	0.260	0.314
LCETR/CITR	5,579	1.009	0.643	0.731	0.976	1.160
PANEL C: Firm Level Controls						
lnMVE	5,579	6.445	2.240	4.806	6.304	7.933
SD CFO	5,579	0.037	0.040	0.015	0.027	0.047
SD Sales	5,579	0.126	0.152	0.045	0.088	0.162
Leverage	5,579	0.171	0.184	0.040	0.140	0.251
Capital Intensity	5,579	0.294	0.246	0.113	0.249	0.413
Intangibles Intensity	5,579	0.014	0.036	0.000	0.000	0.011
Presence of Intangibles	5,579	0.023	0.150	0.000	0.000	0.000
DT	5,579	0.510	28.31	-0.084	0.057	0.338
PANEL D: Country Level Controls						
Trust	98	3.784	1.292	2.700	3.600	5.000
Book-Tax Conformity (*BTC*)	14	0.714	0.469	0.000	1.000	1.000
Legal Origin	14	1.929	0.997	1.000	2.000	3.000
Creditor Rights	14	1.714	0.994	1.000	1.500	3.000
Financial Development	98	65.52	32.38	38.64	60.41	89.45
Tax Evasion	98	1.428	0.435	1.000	1.400	1.700
Dispersed Responsibility	14	0.076	1.351	-0.379	0.140	1.105
VAI	98	1.312	0.237	1.110	1.355	1.510
PVI	98	0.835	0.409	0.640	0.910	1.100
GEI	98	1.409	0.575	0.920	1.575	1.820
RQI	98	1.384	0.346	1.110	1.405	1.670
RLI	98	1.394	0.519	1.030	1.545	1.810
CCI	98	1.452	0.735	1.000	1.530	2.160
WGI	98	1.419	1.748	-1.429	0.151	1.223

Notes:

This table reports the descriptive statistics of the main variables used in this study. **Panel A** reports descriptive statistics for two measures of financial reporting quality. **Panel B** reports descriptive statistics for tax measures, specifically: tax enforcement measures, a measure of statutory corporate income tax rates, and measures of tax avoidance. **Panel C** reports descriptive statistics for firm level controls, while in **Panel D** descriptive statistics of country level controls, used either in the main analysis, or in the robustness checks section, are reported.

Table 2.4: Descriptive statistics by country

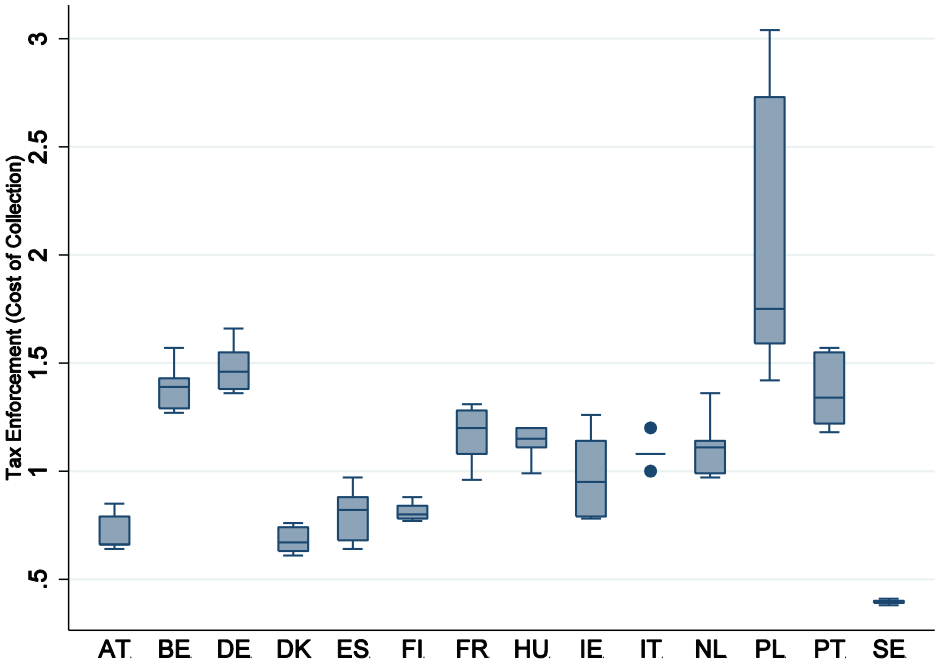
Country	**N**	**DisAccr** (mean)	**AccrQuality** (mean)	**Cost of Collection** (mean)	**Staff** (mean)	**LCETR** (mean)	**CITR** (mean)	**LCETR/CITR** (mean)	**Trust** (mean)	**Book-Tax Conformity**	**Legal Origin**
Austria	154	-0.042	-0.036	0.709	0.803	0.251	0.250	1.004	4.214	Quasi-dep.	German
Belgium	238	-0.060	-0.040	1.387	n.a.	0.246	0.340	0.725	3.486	Quasi-dep.	French
Denmark	266	-0.049	-0.035	0.680	0.524	0.254	0.259	0.987	5.843	Independent	Scandinavian
Finland	385	-0.051	-0.036	0.809	0.503	0.245	0.260	0.943	5.500	Quasi-dep.	Scandinavian
France	1,484	-0.042	-0.033	1.179	0.257	0.347	0.334	1.039	3.586	Quasi-dep.	French
Germany	1,029	-0.046	-0.042	1.473	0.401	0.345	0.333	1.051	4.071	Independent	German
Hungary	49	-0.041	-0.044	1.134	0.483	0.170	0.169	0.994	2.086	Quasi-dep.	German
Ireland	77	-0.063	-0.041	0.974	0.405	0.179	0.125	1.432	3.157	Quasi-dep.	English
Italy	511	-0.041	-0.027	1.086	0.482	0.401	0.339	1.196	2.014	Quasi-dep.	French
the Netherlands	343	-0.053	-0.037	1.101	0.377	0.236	0.269	0.883	5.214	Independent	French
Poland	98	-0.078	-0.058	2.027	0.389	0.209	0.190	1.101	2.157	Independent	German
Portugal	112	-0.045	-0.037	1.357	0.394	0.308	0.257	1.197	3.229	Quasi-dep.	French
Spain	322	-0.040	-0.037	0.799	0.42	0.232	0.304	0.772	3.114	Quasi-dep.	French
Sweden	511	-0.048	-0.036	0.394	0.323	0.261	0.273	0.960	5.300	Quasi-dep.	Scandinavian

Notes:

DisAccr and *AccrQuality* are the measures of financial reporting quality, in which higher values mean higher financial reporting quality. The proxy for tax enforcement *Cost of Collection*, as well as the cultural measure of *Trust*, all capture the mean value by country from 2005 to 2011. *Staff* is also a proxy for tax enforcement, although data is available just for the year 2011. *LCETR* captures firms' long-run cash effective tax rate over a five-year horizon. Reported *LCETR* correspond to mean firm values in each country from 2005 to 2011. *CITR* correspond to the mean statutory corporate income tax rate from 2005 to 2011, by country. *Book-Tax Conformity* refers to the degree of dependency of tax rules on accounting rules, in which quasi-dependent (independent) tax regimes relate to countries with high (low) *Book-Tax Conformity*. The last column contains the *Legal Origin* of each country.

Figure 2.1: Country variation on tax enforcement

This figure plots the distribution of tax enforcement by country from 2005 to 2011. Tax enforcement is proxied by the *Cost of Collection* ratio.



Source: Authors

Table 2.5: Correlation analyses

Variable		*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*	*(17)*	*(18)*	*(19)*	*(20)*	*(21)*	*(22)*	*(23)*	*(24)*	*(25)*
DisAccr	*(1)*	1																						
AccrQuality	*(2)*	0.35*	1																					
Cost of Collection	*(3)*	-0.02	-0.04*	1																				
Staff	*(4)*	-0.02	-0.01	-0.20*	1																			
LCETR	*(5)*	0.02	0.01	0.13*	-0.09*	1																		
CETR	*(6)*	-0.03*	0.01	0.02	-0.01	0.45*	1																	
CITR	*(9)*	0.06*	0.00	0.34*	-0.35*	0.22*	0.07*	1																
LCETR/CIT	*(10)*	0.00	0.00	0.05*	0.00	0.95*	0.44*	-0.05*	1															
lnMVE	*(11)*	0.15*	0.11*	-0.28*	0.07*	-0.13*	-0.06*	-0.17*	-0.09*	1														
SD CFO	*(12)*	-0.40*	-0.25*	0.03*	0.01	-0.01	0.02	-0.08*	0.01	-0.23*	1													
SD Sales	*(13)*	-0.19*	-0.22*	-0.01	0.03*	-0.01	0.00	-0.14*	0.04*	-0.13*	0.33*	1												
Leverage	*(14)*	0.03*	-0.01	-0.07*	0.05*	-0.03*	0.00	0.02	-0.04*	0.18*	-0.18*	-0.13*	1											
Capital Intensity	*(15)*	0.04*	0.04*	-0.04*	0.20*	-0.11*	-0.05*	-0.09*	-0.09*	0.12*	-0.12*	-0.11*	0.40*	1										
Intangibles Intensity	*(16)*	-0.02	0.00	0.02	0.02	0.02	-0.01	0.03*	0.01	0.10*	0.01	-0.05*	-0.09*	-0.16*	1									
Pres. of Intangibles	*(17)*	-0.11*	-0.06*	-0.11*	0.01	-0.10*	-0.06*	-0.10*	-0.07*	-0.03*	0.18*	0.02	-0.05*	0.09*	-0.06*	1								
DT	*(18)*	0.00	0.00	0.00	0.02	0.00	0.07*	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.04*	-0.01	0.00	1							
Trust	*(19)*	-0.04*	-0.01	-0.44*	0.09*	-0.16*	-0.08*	-0.30*	-0.09*	0.14*	0.07*	0.08*	-0.04*	-0.07*	0.11*	0.07*	-0.02	1						
Tax Conformity	*(20)*	0.05*	0.07*	-0.41*	-0.17*	0.01	0.03*	0.04*	0.00	0.00	-0.07*	-0.08*	0.07*	-0.01	-0.10*	-0.01	0.01	-0.30*	1					
Legal Origin	*(21)*	-0.06*	-0.04*	-0.43*	0.36*	-0.14*	-0.06*	-0.54*	0.01	0.19*	0.06*	0.13*	-0.03*	0.04*	0.09*	0.11*	-0.01	0.62*	-0.21*	1				
Creditor Rights	*(22)*	-0.03*	-0.05*	0.13*	0.64*	-0.05*	-0.01	-0.07*	-0.02	0.07*	0.03*	0.04*	0.02	0.13*	0.06*	0.02	0.01	0.18*	-0.74*	0.21*	1			
Financial Development	*(23)*	0.03	0.00	-0.59*	-0.10*	-0.14*	-0.13*	-0.08*	-0.13*	0.13*	-0.04*	0.04*	0.03*	-0.03*	-0.03*	0.04*	-0.02	0.44*	0.34*	0.13*	-0.30*	1		
Tax Evasion	*(24)*	-0.06*	-0.06*	-0.29*	0.21*	-0.13*	-0.04*	-0.45*	-0.01	0.23*	0.03*	0.08*	0.02	0.16*	-0.03*	0.14*	0.01	0.05*	0.04*	0.44*	0.04*	-0.02	1	
Dispersed Responsibility	*(25)*	-0.01	-0.01	-0.18*	0.48*	-0.07*	0.03*	-0.28*	0.01	0.17*	-0.01	0.01	0.09*	0.21*	-0.04*	0.07*	0.02	-0.13*	-0.23*	0.22*	0.52*	-0.31*	0.52*	1

Notes:

Univariate analyses are reported. The symbol * represents significant a level of 5%.

Table 2.6: Effect of tax enforcement on financial reporting quality

		FRQ(DisAccr)		*FRQ(AccrQuality)*	
	Sign	(1)	(2)	(3)	(4)
Tax Enforcement					
Cost of Collection	+	0.018***		0.011**	
		(0.005)		(0.005)	
Staff	+		4.780***		1.508***
			(0.610)		(0.323)
Firm Level Controls					
lnMVE	+	0.002***	0.001	0.001***	0.002***
		(0.000)	(0.001)	(0.000)	(0.000)
SD CFO	–	-0.431***	-0.318***	-0.204***	-0.185***
		(0.070)	(0.101)	(0.019)	(0.043)
SD Sales	–	-0.019	0.034	-0.041***	-0.020
		(0.013)	(0.040)	(0.009)	(0.019)
Leverage	–	-0.020***	-0.011	-0.025***	-0.026
		(0.006)	(0.017)	(0.006)	(0.015)
Capital Intensity (*CI*)	–	0.005	0.013**	0.011**	-0.001
		(0.005)	(0.006)	(0.005)	(0.008)
Intangibles Intensity (*II*)	–	-0.044*	-0.071	-0.014	-0.093
		(0.022)	(0.046)	(0.012)	(0.060)
Presence of Intangibles (*PI*)	–	-0.014*	-0.021	-0.007	-0.016*
		(0.007)	(0.013)	(0.005)	(0.009)
Country Level Controls					
Trust (Culture)	?	-0.004*	0.105***	-0.003	0.031***
		(0.002)	(0.014)	(0.002)	(0.007)
Constant	?	-0.044***	-2.206***	-0.052***	-0.703***
		(0.010)	(0.282)	(0.009)	(0.147)
Country FE		YES	YES	YES	YES
Year FE		YES	NO	YES	NO
Time period		2005-11	2011	2005-11	2011
N		5,579	763	5,579	763
Adj. R^2		0.188	0.145	0.132	0.168

Notes:

$FRQ_{ict} = \beta_0 + \beta_1 Tax\ Enforcement_{ct} + \beta_2 lnMVE_{it} + \beta_3 SD\ CFO_{it} + \beta_4 SD\ Sales_{it} + \beta_5 Leverage_{it} + \beta_6 CI_{it} + \beta_7 II_{it} + \beta_8 PI_{it} + \beta_9 Trust_{ct} + \sum_{c=1}^{14} Y_c + \sum_{t=1}^{7} \delta_t + \varepsilon_{ict}$

The dependent variable in columns (1) and (2) is: *DisAccr*, which is a measure of financial reporting quality (*FRQ*), obtained from the absolute residuals from regressing equation (1). The dependent variable in columns (3) and (4) is: *AccrQuality*, which is a measure of financial reporting quality obtained from the absolute residuals from regressing equation (3). Both variables are multiplied by -100, to make interpretation easier. While in columns (1) and (3) tax enforcement is proxied by the *Cost of Collection* ratio, in columns (2) and (4), the portion of *Staff* usage for functions of verification and tax debt collection over all FTE staff proxies for tax enforcement. Other controls are included, as detailed in Table 2.2. There is no available data for *Staff* for years other than 2011. Year and country fixed effects (FE) specification is included.

Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 2.7: The role of firm level of tax avoidance on the relation between tax enforcement on financial reporting quality

		FRQ(DisAccr)						*FRQ(AccrQuality)*					
		Cost of Collection			*Staff*			*Cost of Collection*			*Staff*		
	Sign	ALL (1)	Higher LCETR (2)	Lower LCETR (3)	ALL (4)	Higher LCETR (5)	Lower LCETR (6)	ALL (7)	Higher LCETR (8)	Lower LCETR (9)	ALL (10)	Higher LCETR (11)	Lower LCETR (12)
Tax Measures													
Tax Enforcement	+	0.017**	0.016	0.021***	4.792***	0.672	4.945***	0.008	0.013	0.012**	1.115***	-7.351***	3.266***
		(0.006)	(0.011)	(0.004)	(0.774)	(0.489)	(1.090)	(0.005)	(0.012)	(0.005)	(0.291)	(0.508)	(0.240)
Tax Enforcement × LCETR	?	0.004			0.055			0.012			0.002		
		(0.010)			(0.038)			(0.007)			(0.026)		
LCETR	?	-0.005			-0.032**			-0.013			-0.002		
		(0.011)			(0.013)			(0.008)			(0.012)		
Controls (output omitted)													
Firm Level Controls		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Level Controls		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE		YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO
Time period		2005-11	2005-11	2005-11	2011	2011	2011	2005-11	2005-11	2005-11	2011	2011	2011
N		5,579	2,790	2,789	763	382	381	5,579	2,790	2,789	763	382	381
Adj. R^2		0.188	0.173	0.204	0.146	0.176	0.174	0.132	0.121	0.147	0.184	0.093	0.293

Notes:

$FRQ_{ict} = \beta_0 + \beta_1 Tax\ Enforcement_{ct} + b_1(Tax\ Enforcement_{ct} \times LCETR_{ict}) + b_2 LCETR_{ict} + \beta_2 lnMVE_{it} + \beta_3 SD\ CFO_{it} + \beta_4 SD\ Sales_{it} + \beta_5 Leverage_{it} + \beta_6 CI_{it} + \beta_7 II_{it} + \beta_8 PI_{it} + \beta_9 Trust_{ct} + \sum_{c=1}^{14} \Upsilon_c + \sum_{t=1}^{7} \delta_t + \varepsilon_{ict}$

The dependent variable in columns (1) through to (6) is: *DisAccr*, which is a measure of financial reporting quality (*FRQ*), obtained from the absolute residuals from regressing equation (1). The dependent variable in columns (7) through to (12) is: *AccrQuality*, which is a measure of financial reporting quality, obtained from the absolute residuals from regressing equation (3). Both variables are multiplied by -100 to make interpretation easier. While in columns (1) through to (3), and (7) through to (9), tax enforcement is proxied by the *Cost of Collection* ratio, in columns (4) through to (6), and (10) through to (12), the portion of *Staff* usage for functions of verification and tax debt collection over all FTE staff proxies for tax enforcement. As in Table 2.6, other controls are included. In some estimations the firm level of tax avoidance is stressed with the country level of tax enforcement, while in others, the sample is split into two parts by the median. This distinguishes firm observations with *higher LCETR* from those with *lower LCETR*. There is no available data of *Staff* for years other than 2011. Year and country fixed effects (FE) specification is included.

Coefficients for controls are not reported. Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 2.8: Mean comparison of financial reporting quality by levels of tax avoidance

Measures of Financial Reporting Quality	Higher ETR	Lower ETR	Two-sample *t-test*		
			Difference (Higher-Lower)	*t-statistic*	*p-value*
	(1)	(2)	(3)	(4)	(5)
LCETR					
DisAccr	-0.0450	-0.0476	0.0026**	2.0154	0.0220
	(0.00084)	(0.00097)	(0.00128)		
AccrQuality	-0.0357	-0.0371	0.0014	1.2651	0.1029
	(0.00076)	(0.00081)	(0.00111)		
CETR					
DisAccr	-0.0457	-0.0469	0.0012	0.9652	0.1672
	(0.00085)	(0.00096)	(0.00128)		
AccrQuality	-0.0357	-0.0370	0.0013	1.1416	0.1268
	(0.00077)	(0.00080)	(0.00111)		
LCETR/CITR					
DisAccr	-0.04630	-0.04631	0.00001	0.0095	0.4962
	(0.00085)	(0.00096)	(0.00128)		
AccrQuality	-0.0360	-0.0368	0.0008	0.7447	0.2283
	(0.00077)	(0.00080)	(0.00111)		

Notes:

The sample is split into two parts by the median of either *LCETR*, *CETR*, or *LCETR/CITR*. The first column of data presents statistics for firms with effective tax rates (*ETR*) that are higher than the median (engaged in less tax avoidance), while the second column presents statistics for firms with *ETR* that are lower than the median (engaged in more tax avoidance). The third column computes the difference between the two groups.

Standard errors are in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively. The *p-value* presented is for a one-tailed test (positive difference), as the aim is to understand whether financial reporting quality (either *DisAccr* or *AccrQuality*) is higher for firms engaged in less tax avoidance (in the group of *higher LCETR*).

Table 2.9: The role of statutory corporate income tax rates on the relation between tax enforcement and financial reporting quality

		FRQ(DisAccr)						*FRQ(AccrQuality)*					
		Cost of Collection			*Staff*			*Cost of Collection*			*Staff*		
	Sign	ALL (1)	Higher CITR (2)	Lower CITR (3)	ALL (4)	Higher CITR (5)	Lower CITR (6)	ALL (7)	Higher CITR (8)	Lower CITR (9)	ALL (10)	Higher CITR (11)	Lower CITR (12)
Tax Measures													
Tax Enforcement	+	0.031***	0.035**	0.021***	0.492	0.049	4.822***	0.010	0.030**	0.013**	0.182	-0.157*	1.819***
		(0.005)	(0.009)	(0.003)	(0.331)	(0.032)	(0.684)	(0.012)	(0.007)	(0.006)	(0.146)	(0.041)	(0.251)
Tax Enforcement × CITR	?	-0.033			-1.424			0.015			-0.473		
		(0.022)			(1.293)			(0.043)			(0.559)		
CITR	?	-0.036			1.307**			-0.079			0.418*		
		(0.031)			(0.541)			(0.082)			(0.215)		
Controls (output omitted)													
Firm Level Controls		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Level Controls		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE		YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO
Time period		2005-11	2005-11	2005-11	2011	2011	2011	2005-11	2005-11	2005-11	2011	2011	2011
N		5,579	2,999	2,580	763	331	432	5,579	2,999	2,580	763	331	432
Adj. R^2		0.188	0.207	0.189	0.145	0.234	0.131	0.132	0.135	0.143	0.168	0.124	0.189

Notes:

$$FRQ_{ict} = \beta_0 + \beta_1 Tax\ Enforcement_{ct} + b_1(Tax\ Enforcement_{ct} \times CITR_{ct}) + b_2 CITR_{ct} + \beta_2 lnMVE_{it} + \beta_3 SD\ CFO_{it} + \beta_4 SD\ Sales_{it} + \beta_5 Leverage_{it} + \beta_6 CI_{it} + \beta_7 II_{it} + \beta_8 PI_{it} + \beta_9 Trust_{ct} + \sum_{c=1}^{14} Y_c + \sum_{t=1}^{7} \delta_t + \varepsilon_{ict}$$

The dependent variable in columns (1) through to (6) is: *DisAccr*, which is a measure of financial reporting quality (*FRQ*), obtained from the absolute residuals from regressing equation (1). The dependent variable in columns (7) through to (12) is: *AccrQuality*, which is a measure of financial reporting quality, obtained from the absolute residuals from regressing equation (3). Both variables are multiplied by -100 to make interpretation easier. While in columns (1) through to (3), and (7) through to (9), tax enforcement is proxied by the *Cost of Collection* ratio, in columns (4) through to (6), and (10) through to (12), the portion of *Staff* usage for functions of verification and tax debt collection over all FTE staff proxies for tax enforcement. As in Table 2.6, other controls are included. In some estimations, the statutory corporate income tax rate (*CITR*) is stressed with the country level of tax enforcement, while in others, the sample is split into two parts by the median. One part comprises countries with higher *CITR*, while countries which levy lower *CITR* are combined in a different subsample. There is no available data of *Staff* for years other than 2011. Year and country fixed effects (FE) specification is included.

Coefficients for controls are not reported. Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 2.10: The role of book-tax conformity (*BTC*) on the relation between tax enforcement and financial reporting quality

		FRQ(DisAccr)						*FRQ(AccrQuality)*					
		Cost of Collection			*Staff*			*Cost of Collection*			*Staff*		
	Sign	ALL (1)	High BTC (2)	Low BTC (3)	ALL (4)	High BTC (5)	Low BTC (6)	ALL (7)	High BTC (8)	Low BTC (9)	ALL (10)	High BTC (11)	Low BTC (12)
Tax Measures													
Tax Enforcement	+	0.018**	0.025**	0.020*	0.555***	-0.357**	0.067	0.017***	0.009	0.018*	0.169***	-0.032	0.038
		(0.006)	(0.009)	(0.008)	(0.083)	(0.108)	(0.036)	(0.002)	(0.009)	(0.007)	(0.041)	(0.068)	(0.033)
Tax Enforcement × BTC	?	0.003			-0.652***			-0.019*			-0.192**		
		(0.008)			(0.128)			(0.010)			(0.083)		
BTC	?	0.044***			0.210***			0.058***			0.059**		
		(0.014)			(0.037)			(0.014)			(0.023)		
Controls (output omitted)													
Firm Level Controls		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Level Controls		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE		YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO
Time period		2005-11	2005-11	2005-11	2011	2011	2011	2005-11	2005-11	2005-11	2011	2011	2011
N		5,579	3,843	1,736	763	515	248	5,579	3,843	1,736	763	515	248
Adj. R^2		0.188	0.212	0.172	0.144	0.269	0.147	0.132	0.129	0.129	0.186	0.146	0.226

Notes:

$FRQ_{ict} = \beta_0 + \beta_1 Tax\ Enforcement_{ct} + b_1(Tax\ Enforcement_{ct} \times BTC_{ct}) + b_2 BTC_{ct} + \beta_2 lnMVE_{it} + \beta_3 SD\ CFO_{it} + \beta_4 SD\ Sales_{it} + \beta_5 Leverage_{it} + \beta_6 CI_{it} + \beta_7 II_{it} + \beta_8 PI_{it} + \beta_9 Trust_{ct} + \sum_{c=1}^{14} Y_c + \sum_{t=1}^{7} \delta_t + \varepsilon_{ict}$

The dependent variable in columns (1) through to (6) is: *DisAccr*, which is a measure of financial reporting quality (*FRQ*), obtained from the absolute residuals from regressing equation (1). The dependent variable in columns (7) through to (12) is: *AccrQuality*, which is a measure of financial reporting quality, obtained from the absolute residuals from regressing equation (3). Both variables are multiplied by -100 to make interpretation easier. While in columns (1) through to (3), and (7) through to (9), tax enforcement is proxied by the *Cost of Collection* ratio, in columns (4) through to (6), and (10) through to (12), the portion of *Staff* usage for functions of verification and tax debt collection over all FTE staff proxies for tax enforcement. As in Table 2.6, other controls are included. *Book-tax conformity* (*BTC*) is a dummy variable taking the value one when the *BTC* is *high*, and zero for countries with *low BTC*. In some estimations countries book-tax conformity is stressed with the country level of tax enforcement, while in others the sample is split into two parts by book-tax conformity. This distinguishes firm observations in countries with *high BTC* from those with *low BTC*. There is no available data of *Staff* for years other than 2011. Year and country fixed effects (FE) specification is included.

Coefficients for controls are not reported. Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 2.11: Discriminant analysis for book-tax conformity as grouping variable

Panel A: Standardised canonical discriminant function coefficients

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Time range	2005-2011	2005-2011	2011	2011	2011
	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)
LCETR	0.1017 (3)	0.0336 (4)	0.0304 (4)	0.1042 (4)	-0.0167 (5)
CITR	0.1666 (2)	-0.2082 (3)	-0.8376 (1)	-0.5313 (3)	-0.6395 (1)
DT	-0.0091 (4)	0.0080 (5)	0.0408 (3)	0.0276 (5)	0.0377 (4)
Trust	1.0470 (1)	1.0993 (2)	0.3762 (2)	0.8953 (2)	0.4660 (2)
Cost of Collection		1.2707 (1)		1.2043 (1)	
Staff					0.2831 (3)

Panel B: Model statistics

	Function 1	**Function 1**	**Function 1**	**Function 1**	**Function 1**
Canonical correlation	0.305	0.680	0.329	0.637	0.316
Eigenvalue	0.103	0.859	0.122	0.683	0.111
Likelihood ratio	0.907	0.538	0.892	0.594	0.900
F-value	143.2	957.3	24.08	108.1	16.82
p-value	0.000 [e]	0.000 [e]	0.000 [e]	0.000 [e]	0.000 [e]

e – *exact F*

Panel C: Predicted group membership (number and percentage correct)

True Book-Tax Conformity (*BTC*)	Low | High	Low | High	Low | High	Low | High	Low | High
Low BTC	252 | 1,484	1,502 | 234	101 | 147	212 | 36	51 | 197
	14.5% | 85.5%	86.5% | 13.5%	40.7% | 59.3%	85.5% | 14.5%	20.6% | 79.4%
High BTC	556 | 3,287	216 | 3,627	92 | 457	14 | 535	88 | 427
	14.5% | 85.5%	5.6% | 94.4%	16.8% | 83.2%	2.6 | 97.4%	17.1% | 82.9%
% of original grouped cases correctly classified	63.4%	91.9%	70.0%	93.7%	62.6%

Notes: Canonical linear discriminant analysis for book-tax conformity.

$\omega_1 = \beta_1 LCETR + \beta_2 CITR + \beta_3 DT + \beta_4 Trust + \beta_5 Tax\ Enforcement$

The group structure is described as follows: Group 1, n_1 = 1,736 firms in countries with low book-tax conformity (independency between tax rules and accounting rules) Group 2, n_2 = 3,843 firms in countries with high book-tax conformity (*BTC*). Variables used to predict group membership are all tax related: (i) firms' long-run cash effective tax rate (*LCETR*); (ii) a measure of country level tax burden (*CITR*); (iii) the portion of deferred taxation over firms pre-tax earnings (*DT*); (iv) the cultural variable *Trust*, and; (v) a tax enforcement measure at country level – *Cost of Collection* or *Staff*. The analysis runs from 2005 to 2011 in Models 1 and 2, while in Models 3 through 5 the analysis is for 2011.

Columns of **Panel A** identifies the relative importance of the predictors. It illustrates the correlation of each variable with the corresponding discriminant function. The five models consider different combinations of predictors in two time ranges.

Panel B describes how the discriminant function explain the variance of the grouping variable. The canonical correlation comprises the multiple correlation between the predictors and the discriminant function. The canonical correlation of 0.680 (Model 2) is an overall index to assess the model fit and suggests that about 46.2% of the variation in the grouping variable (*low* and *high BTC*) is explained by the model.

Panel C describes models hit ratio, which predicts that with the cross-validated classification, about 91.9% (Model 2) of observations were correctly classified into each grouping variable.

Table 2.12: The role of legal origin on the relation between tax enforcement and financial reporting quality

		FRQ(DisAccr)								*FRQ(AccrQuality)*							
		Cost of Collection				*Staff*				*Cost of Collection*				*Staff*			
	Sign	English (1)	French (2)	German (3)	Scandina-vian (4)	English (5)	French (6)	German (7)	Scandina-vian (8)	English (9)	French (10)	German (11)	Scandina-vian (12)	English (13)	French (14)	German (15)	Scandina-vian (16)
Tax Measures																	
Tax Enforcement	?	0.020	0.013	0.013	-0.082	-0.064**	0.248	0.198***	n.a.	0.009	0.014	-0.047	-0.061	0.068**	0.113	0.030	n.a.
		(0.011)	(0.011)	(0.010)	(0.000)	(0.017)	(0.156)	(0.007)		(0.008)	(0.009)	(0.034)	(0.000)	(0.023)	(0.116)	(0.017)	
Controls (output omitted)																	
Firm Level Controls		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Level Controls		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE		YES	YES	YES	YES	NO	NO	NO	NO	YES	YES	YES	YES	NO	NO	NO	NO
Time period		2005-11	2005-11	2005-11	2005-11	2011	2011	2011	2011	2005-11	2005-11	2005-11	2005-11	2011	2011	2011	2011
N		3,010	1,330	1,162	77	396	190	166	11	3,010	1,330	1,162	77	396	190	166	11
Adj. R^2		0.176	0.206	0.194	0.390	0.165	0.323	0.261		0.145	0.098	0.128	0.342	0.254	0.097	0.173	

Notes:

$$FRQ_{ict} = \beta_0 + \beta_1 Tax\ Enforcement_{ct} + \beta_2 lnMVE_{it} + \beta_3 SD\ CFO_{it} + \beta_4 SD\ Sales_{it} + \beta_5 Leverage_{it} + \beta_6 CI_{it} + \beta_7 II_{it} + \beta_8 PI_{it} + \beta_9 Trust_{ct} + \sum_{c=1}^{14} Y_c + \sum_{t=1}^{7} \delta_t + \varepsilon_{ict}$$

The dependent variable in columns (1) through to (8) is: *DisAccr*, which is a measure of financial reporting quality (*FRQ*), obtained from the absolute residuals from regressing equation (1). The dependent variable in columns (9) through to (16) is: *AccrQuality*, which is a measure of financial reporting quality, obtained from the absolute residuals from regressing equation (3). Both variables are multiplied by -100 to make interpretation easier. While in columns (1) through to (4), and (9) through to (12), tax enforcement is proxied by the *Cost of Collection* ratio, in columns (5) through to (8), and (13) through to (16), the portion of *Staff* usage for functions of verification and tax debt collection over all FTE staff proxies for tax enforcement. As in Table 2.6, other controls are included. Thorough all columns the sample is split into four parts to consider countries legal origin. Specifically, countries with English common law legal origin, French civil law, German civil law, and Scandinavian civil law. There is no available data of *Staff* for years other than 2011. Year and country fixed effects (FE) specification is included.

Coefficients for controls are not reported. Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 2.13: Discriminant analysis for legal origin as grouping variable

Panel A: Standardised canonical discriminant function coefficients

	Model 1			**Model 2**			**Model 3**			**Model 4**		
Time range	2005-2011			2005-2011			2011			2011		
	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)	Coeff. (rank)
lnMVE	0.244 (2)	0.258 (2)	0.954 (1)	0.026 (3)	-0.265 (3)	-0.592 (2)	0.025 (3)	-0.333 (3)	0.908 (1)	0.156 (3)	0.004 (4)	1.005 (1)
Leverage	-0.008 (3)	0.916 (1)	-0.445 (2)	-0.025 (4)	0.077 (4)	0.904 (1)	0.023 (4)	0.036 (4)	-0.596 (2)	-0.028 (4)	0.219 (2)	-0.360 (2)
Trust	0.977 (1)	-0.051 (3)	-0.214 (3)	0.642 (2)	-0.740 (1)	0.047 (4)	0.703 (1)	-0.670 (2)	-0.270 (3)	1.066 (1)	0.272 (3)	-0.200 (3)
Cost of Collection				-0.759 (1)	-0.677 (2)	0.179 (3)	-0.643 (2)	-0.790 (1)	-0.085 (4)			
Staff										0.718 (2)	-0.852 (1)	-0.107 (4)

Panel B: Model statistics

	Function 1	**Function 2**	**Function 3**	**Function 1**	**Function 2**	**Function 3**	**Function 1**	**Function 2**	**Function 3**	**Function 1**	**Function 2**	**Function 3**
Canonical correlation	0.731	0.069	0.027	0.831	0.468	0.033	0.816	0.404	0.031	0.821	0.359	0.018
Eigenvalue	1.149	0.005	0.001	2.227	0.280	0.001	1.993	0.195	0.001	2.062	0.148	0.000
Likelihood ratio	0.463	0.995	0.999	0.242	0.780	0.999	0.279	0.836	0.999	0.285	0.871	1.000
F-value	561.5	7.670	4.164	872.2	245.2	2.989	107.9	24.75	0.370	101.4	18.05	0.128
p-value	0.000 [a]	0.000 [e]	0.041 [e]	0.000 [a]	0.000 [e]	0.050 [e]	0.000 [a]	0.000 [e]	0.691 [e]	0.000 [a]	0.000 [e]	0.880 [e]

e – *exact F;* a – *approximate F*

Panel C: Predicted group membership (number and percentage correct)

French	2,667	2,758	377	347
	88.6%	91.6%	87.7%	87.6%
German	19	931	72	11
	1.43%	70.0%	37.9%	5.5%
Scandinavian	1,037	1,162	166	166
	89.2%	100.0%	100.0%	100.0%
English	0	0	0	0
	0.0%	0.0%	0.0%	0.0%
% of original grouped cases correctly classified	66.7%	84.2%	77.2%	68.7%

Notes: Canonical linear discriminant analysis for legal origin.

$\omega_2 = \beta_1 lnMVE + \beta_2 Leverage + \beta_3 Tax\ Enforcement$

Our sample of 5,579 firm-year observations is partitioned according to countries legal origin. 3,010 observations relate to firms listed in countries with a French legal origin (n_1), n_2 = 1,330 in German, n_3 = 1,162 in Scandinavian, and n_4 = 77 in English common law countries. Variables used to predict group membership are: (i) a measure of firms' size of market value (*lnMVE*); (ii) firms' *Leverage*; (iii) the cultural variable *Trust*, and; (iv) a tax enforcement measure at country level – *Cost of Collection* or *Staff*. The analysis runs from 2005 to 2011 in Models 1 and 2, while in Models 3 and 4 the analysis is for 2011. Columns of **Panel A** identifies the relative importance of the predictors. It illustrates the correlation of each variable with the corresponding discriminant function. The four models consider different combinations of predictors in two time ranges. **Panel B** describes how the discriminant function explain the variance of the grouping variable. The canonical correlation comprises the multiple correlation between predictors and the discriminant function. **Panel C** describes models hit ratio, which predicts the percentage of observations correctly classified in each grouping variable.

Table 2.14: Robustness check: institutional controls

		FRQ(DisAccr)								*FRQ(AccrQuality)*							
	Sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Tax Enforcement																	
Cost of Collection	+	0.018***	0.020***	0.018***	0.018***	0.019***	0.018***	0.019**	0.018***	0.011**	0.010**	0.011**	0.011**	0.013**	0.011**	0.013**	0.011**
		(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)
Country Level Controls																	
VAI	?	0.012						0.006		-0.007						-0.004	
		(0.013)						(0.016)		(0.010)						(0.011)	
PVI	?		-0.016**					-0.016			0.009					0.010	
			(0.006)					(0.009)			(0.007)					(0.006)	
GEI	?			-0.000				0.002				0.005				0.005	
				(0.007)				(0.008)				(0.009)				(0.007)	
RQI	?				0.002			-0.000					0.005			0.008	
					(0.007)			(0.011)					(0.006)			(0.007)	
RLI	?					-0.006		-0.001						-0.017**		-0.029**	
						(0.014)		(0.011)						(0.007)		(0.010)	
CCI	?						0.003	0.006							0.003	0.004	
							(0.005)	(0.005)							(0.007)	(0.006)	
WGI	?								-0.000								0.000
									(0.000)								(0.000)
Controls (output omitted)																	
Firm Level Controls		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time period		2005-11	2005-11	2005-11	2005-11	2005-11	2005-11	2005-11	2005-11	2005-11	2005-11	2005-11	2005-11	2005-11	2005-11	2005-11	2005-11
N		5,579	5,579	5,579	5,579	5,579	5,579	5,579	5,579	5,579	5,579	5,579	5,579	5,579	5,579	5,579	5,579
Adj. R^2		0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.188	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132

Notes:

$FRQ_{ict} = \beta_0 + \beta_1 Tax\ Enforcement_{ct} + \beta_2 lnMVE_{it} + \beta_3 SD\ CFO_{it} + \beta_4 SD\ Sales_{it} + \beta_5 Leverage_{it} + \beta_6 CI_{it} + \beta_7 II_{it} + \beta_8 PI_{it} + \beta_9 Trust_{ct} + \sum_{c=1}^{14} \Upsilon_c + \sum_{t=1}^{7} \delta_t + \varepsilon_{ict}$

The dependent variable in columns (1) through to (8) is: *DisAccr*, which is a measure of financial reporting quality (*FRQ*), obtained from the absolute residuals from regressing equation (1). The dependent variable in columns (9) through to (16) is: *AccrQuality*, which is a measure of financial reporting quality, obtained from the absolute residuals from regressing equation (3). Both variables are multiplied by -100 to make interpretation easier. Tax enforcement is proxied by the *Cost of Collection* ratio. As in Table 2.6, other controls are included. In each column, the effect of additional controls at country level on financial reporting quality is analysed, and also whether the coefficient of *Cost of Collection* remains positive and statistically significant. These additional controls are detailed in Table 2.2. Year and country fixed effects (FE) specification is included.

Coefficients for controls are not reported. Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 2.15: Robustness check: alternative measures of tax avoidance

		FRQ(DisAccr)						*FRQ(AccrQuality)*					
		Cost of Collection			*Staff*			*Cost of Collection*			*Staff*		
	Sign	ALL	Higher ETR	Lower ETR	ALL	Higher ETR	Lower ETR	ALL	Higher ETR	Lower ETR	ALL	Higher ETR	Lower ETR
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
PANEL A:													
Tax Enforcement	+	0.015**	0.012	0.024***	4.809***	-0.380	10.324***	0.007	0.009	0.013***	1.492***	-2.613**	5.238***
		(0.006)	(0.008)	(0.005)	(0.620)	(0.664)	(1.515)	(0.004)	(0.006)	(0.004)	(0.332)	(0.857)	(0.544)
Tax Enf. × LCETR/CITR	?	0.003			0.017*			0.004			0.003		
		(0.003)			(0.009)			(0.002)			(0.006)		
LCETR/CITR	?	-0.003			-0.009**			-0.004			-0.000		
		(0.004)			(0.003)			(0.003)			(0.004)		
N		5,579	2,790	2,789	763	382	381	5,579	2,790	2,789	763	382	381
Adj. R^2		0.188	0.185	0.204	0.147	0.197	0.174	0.132	0.121	0.145	0.167	0.126	0.208
PANEL B:													
Tax Enforcement	+	0.017**	0.024*	0.012**	5.326***	3.103***	5.745***	0.011**	0.004	0.013**	1.657***	-1.302***	2.954***
		(0.006)	(0.013)	(0.004)	(0.686)	(0.658)	(0.902)	(0.005)	(0.011)	(0.005)	(0.389)	(0.265)	(0.328)
Tax Enforcement × CETR	?	0.003			0.109*			0.002			-0.048*		
		(0.006)			(0.055)			(0.005)			(0.025)		
CETR	?	-0.008			-0.056***			-0.003			0.016		
		(0.007)			(0.018)			(0.004)			(0.010)		
N		5,579	2,790	2,789	763	382	381	5,579	2,790	2,789	763	382	381
Adj. R^2		0.188	0.189	0.194	0.155	0.196	0.149	0.131	0.113	0.155	0.169	0.086	0.212
Controls in Panel A and B (output omitted)													
Firm Level Controls		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Level Controls		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE		YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO
Time period		2005-11	2005-11	2005-11	2011	2011	2011	2005-11	2005-11	2005-11	2011	2011	2011

Notes: $FRQ_{ict} = \beta_0 + \beta_1 Tax\ Enforcement_{ct} + b_1(Tax\ Enforcement_{ct} \times ETR_{ict}) + b_1 ETR_{ict} + CONTROLS + \varepsilon_{ict}$. The dependent variable in columns (1) through to (6) is: *DisAccr*, which is a measure of financial reporting quality, obtained from the absolute residuals from regressing equation (1). The dependent variable in columns (7) through to (12) is: *AccrQuality*, which is a measure of financial reporting quality, obtained from the absolute residuals from regressing equation (3). Both variables are multiplied by -100 to make interpretation easier. While in columns (1) through to (3), and (7) through to (9), tax enforcement is proxied by the *Cost of Collection* ratio, in columns (4) through to (6), and (10) through to (12), the portion of *Staff* usage for functions of verification and tax debt collection over all FTE staff measures tax enforcement. As in Table 2.6, other controls are included. In this robustness analysis, two alternative proxies for tax avoidance are used. **Panel A** reports results using the ratio of *LCETR* over *CITR*, while **Panel B** reports results using *CETR*. In some estimations the firm level of tax avoidance is stressed with the country level of tax enforcement, while in others the sample is split into two parts by the median. This distinguishes firm observations with *higher ETR* (engaged in less tax avoidance) from those with *lower ETR* (engaged in more tax avoidance). There is no available data of *Staff* for years other than 2011. Year and country fixed effects (FE) specification is included. Coefficients for controls are not reported. Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 2.16: Robustness check: random/fixed effect specification at firm level

		FRQ(DisAccr)				*FRQ(AccrQuality)*			
	Sign	ALL (1)	ALL (2)	Higher LCETR (3)	Lower LCETR (4)	ALL (5)	ALL (6)	Higher LCETR (7)	Lower LCETR (8)
PANEL A:									
Tax Measures									
Tax Enforcement	+	0.014**	0.012*	0.013	0.016***	0.011	0.018**	0.013	0.013**
		(0.006)	(0.007)	(0.009)	(0.005)	(0.007)	(0.006)	(0.011)	(0.005)
Tax Enforcement × LCETR	?		0.007				-0.026**		
			(0.014)				(0.009)		
LCETR	?		-0.008				0.023*		
			(0.020)				(0.011)		
Controls (output omitted)									
Firm Level Controls		YES	YES	YES	YES	YES	YES	YES	YES
Country Level Controls		YES	YES	YES	YES	YES	YES	YES	YES
Firm FE / RE		FE	FE	FE	FE	FE	FE	FE	FE
Year FE / RE		FE	FE	FE	FE	FE	FE	FE	FE
Time period		2005-11	2005-11	2005-11	2005-11	2005-11	2005-11	2005-11	2005-11
N		5,579	5,579	2,790	2,789	5,579	5,579	2,790	2,789
Adj. R^2		0.310	0.310	0.303	0.303	0.212	0.212	0.219	0.242
PANEL B: Hausman test									
χ^2		266.20	265.67	45.27	197.03	159.94	171.81	83.78	69.87
p-value		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes:

$FRQ_{ict} = \beta_0 + \beta_1 Tax\ Enforcement_{ct} + b_1(Tax\ Enforcement_{ct} \times LCETR_{ict}) + b_2 LCETR_{ict} + \beta_2 lnMVE_{it} + \beta_3 SD\ CFO_{it} + \beta_4 SD\ Sales_{it} + \beta_5 Leverage_{it} + \beta_6 CI_{it} + \beta_7 II_{it} + \beta_8 PI_{it} + \beta_9 Trust_{ct} + \sum_{i=1}^{797} \Upsilon_c + \sum_{t=1}^{7} \delta_t + \varepsilon_{ict}$

This table distinguishes from estimations in Table 2.6 and Table 2.7, by using a fixed effects specification at firm level, rather than at country level.

Panel A. The dependent variable in columns (1) through to (4) is: *DisAccr*, which is a measure of financial reporting quality (*FRQ*), obtained from the absolute residuals from regressing equation (1). The dependent variable in columns (5) through to (8) is: *AccrQuality*, which is a measure of financial reporting quality, obtained from the absolute residuals from regressing equation (3). Both variables are multiplied by -100 to make interpretation easier. In all estimations, *LCETR* proxy for tax avoidance and *Cost of Collection* is the measure of tax enforcement. Estimations using *Staff* as a measure of tax enforcement are not properly computable, owing to insufficient observations per firm. In some estimations, the firm level of tax avoidance is stressed with the country level of tax enforcement, while in others the sample is split into two parts by the median. This distinguishes firm observations with higher *LCETR* from those with lower *LCETR*. Results in columns (1) and (5) are directly comparable with the results detailed in Table 2.6, while the results in the remaining columns are comparable with the results detailed in Table 2.7.

Panel B reports the results for the Hausman test. This aims to assess whether fixed or random effects specification are appropriate to control for each firms' omitted variables.

Coefficients for controls are not reported. Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

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3. Disclosure of Income Taxes and Firm Value: a Cross Country Comparison of IFRS Adopters

Abstract

This paper examines whether disclosure of income taxes is associated with firms' value. We focus on all IAS 12 disclosure requirements in a sample of IFRS adopters in Europe, rather than in the US. The disclosure of income taxes is measured by an index based on hand-collected data from annual reports, which made it possible to distinguish between mandatory and voluntary disclosure of income taxes. Results suggest no direct relation between mandatory disclosure of income taxes and firms' value. However, when the level of tax avoidance is taken into consideration the association is significant. Tax avoidance strategies are viewed with scepticism by investors, although disclosure of income taxes mitigates this negative effect, especially for tax aggressive firms, and for "poorly"-governed firms, which is measured by lower institutional ownership. Findings suggest that disclosure of income taxes might play a role in shaping the relation between tax avoidance strategies and firms' value, rather than the quality of corporate governance.

JEL classification: H26; G14; M41; G30

Keywords: Tax Avoidance; Disclosure; Firm Value; Market Reaction

3.1. Introduction

The aim of this paper is to search the impact of disclosure of tax information in the notes to the financial statements on firms' value. When assessing firms' value, investors might require more disclosure of income taxes, depending on firms' level of tax avoidance. The rationale is that disclosure offsets corporate transparency problems which are triggered by tax avoidance strategies.

In terms of accounting standards for income taxes, IAS 12 (*Income Taxes*) provides the framework for IFRS adopters, while for US GAAP, the framework is set by the ASC 740 (formerly known as FAS 109, which includes the standard interpretation FIN 48). Both accounting standards share most of the fundamental principles. Notwithstanding the efforts of convergence between the IASB and the FASB, some differences in the details persist. For instance, deferred tax assets or liabilities resulting from revaluation of plant, property, and equipment and intangible assets may be recognized in Other Comprehensive Income under IFRS (IAS 12 ¶62), whereas they are not applicable under US GAAP, as revaluation is prohibited (ASC 740-10-25). Differences in recognition and measurement imply that disclosure is divergent. Research has mostly focussed on the FIN 48, which entered in force in 2007 in the US (e.g., Blouin, Gleason, Mills, and Sikes (2007); Robinson and Schmidt (2013)).[21] The FIN 48 provides explicit guidance on uncertain tax positions, although IAS 12 does not explicitly address this topic. Moreover, firms' disclosure of income taxes varies in countries that have adopted IFRS (Kvaal & Nobes, 2013).

[21] The FIN 48 is a Financial Accounting Standards Board Interpretation which "clarifies the accounting for uncertainty in income taxes recognized in an enterprise's financial statements in accordance with FASB Statement No. 109, Accounting for Income Taxes." (FASB, 2006).

The first aim of this study is to understand what drives firms to not provide full disclosure of income taxes. By disclosure of income taxes, we mean the quantity and quality of disclosures in the notes to the financial statements, complying with IAS 12 requirements. Full disclosure might take place, should it be costless and if it credibly announced (Siew & Chuan, 1991). The underlying idea supporting less disclosure is that managers might be incentivised to manage information disclosed, depending on whether firms pay lower income taxes, or not. Firms are required to disclose information about income taxes in annual reports, and this might vary, amongst others, according to managers' discretion. Some uncertainty regarding the financial statements regarding tax issues is subject to the judgment of managers and might be used to achieve reporting objectives (Hanlon & Heitzman, 2010). These reporting objectives affect return metrics, which is precisely the main aim of this paper – to understand the consequences of the disclosure of income taxes on firms' value.

As firms become more transparent through disclosure, shareholders' investments become less risky. However, at the same time, the tax administration reinforces their monitoring as their priority interest regarding firms' earnings. It is precisely here where these two players might enter conflict. Full transparency mitigates agency issues, although it constrains the ability to manage tax liability imposed by tax laws. Thus, shareholders might penalise disclosure on the account of the fact that with the increase in disclosure, firms become more exposed to the scrutiny of the tax administration. On the other hand, shareholders might require more disclosure, depending on the level of information asymmetry and on the strength of monitoring managers' actions – agency tension. Tax avoidance strategies might be used by managers to divert value from shareholders, and thus disclosure might be welcomed by investors.

To empirically analyse the influence of the disclosure of income taxes on firms' value we exploit a unique setting, in which we develop a disclosure index for 2012, based on hand-collected data from 185 firms listed on the main stock indexes of 8 European countries, all of them IFRS adopters. The scoring of disclosure assesses IAS 12 disclosure requirements at three levels: (i) quantitative disclosure; (ii) qualitative disclosure or explanation; and (iii) comparability with prior years. This index captures the mandatory disclosure of income taxes, whilst voluntary disclosure of income taxes is measured by a dummy variable. This variable distinguishes firms that disclose information about income taxes exceeding IAS 12 disclosure requirements. The cross-section analysis controls for the institutional setting of each European country.

Results suggest that tax aggressive firms disclose more mandatory information on income taxes in the notes to the financial statements. This conclusion fits with the intuition that riskier strategies, such as tax avoidance, require disclosure in order to mitigate transparency issues (e.g., Wang (2011); Balakrishnan, Blouin, and Guay (2012)). Non-firm-specific variables appear to explain firms' variations on disclosure of income taxes. This particularly applies to the case of institutional variables, confirming the existence of different patterns of disclosure of income taxes across countries, as suggested by Kvaal and Nobes (2013). On the other hand, larger firms, and also firms with declining sales, are more likely to disclose voluntary information about income taxes.

With regards to the effect of disclosure of income taxes on firms' value, the findings are surprising. Disclosure of income taxes does not directly affect firms' value. However, in the case of tax aggressive firms, higher disclosure of income taxes leads to greater firm value. This finding is consistent with shareholders rewarding disclosure in

the presence of increased information asymmetry from tax avoidance, especially in the case of tax aggressive firms. We also find that for firms' engaged in less tax avoidance, neither disclosure, nor tax avoidance, influences firms' value. The conclusions noted above hold good for firms with a higher quality of corporate governance. For "well"-governed firms, measured as being firms with higher institutional ownership, shareholders do not value the disclosure of income taxes. The intuition is that there are no concerns about tax avoidance strategies, as the governance is strong. In the case of "poorly"-governed firms, tax avoidance decreases firms' value, although disclosure of income taxes mitigates this negative effect. Additionally, we carry out a battery of robustness checks, which all corroborate the original findings.

This paper contributes to the current literature for several reasons. Firstly, to the best of our knowledge, it is the first study to focus on all IAS 12 disclosure requirements. Kvaal and Nobes (2013) only focus on two numerical reconciliations mandated by IAS 12. Wahab and Holland (2012) focus on the reconciliation between actual tax expense and notional expense, which is required by IAS 12 to be disclosed in the notes to the financial statements. Nonetheless, the scope of both these studies is well distanced from that of ours. Our focus is on IFRS adopters in Europe, rather than in the US, on which most of the literature is based. Secondly, the features of our hand-collected data makes it possible to distinguish between mandatory and voluntary disclosure of income taxes, and we find different patterns between the two types of disclosure. This distinction has revealed interesting features because: we find that both measures of disclosure are not affected by the same determinants, and; we find that the effect of disclosure of income taxes on firms' value is not the same, whether one considers mandatory disclosure or voluntary disclosure. Thirdly, this paper contributes

to the current debate on how tax avoidance is linked to firms' value. Desai and Dharmapala (2009) show that the quality of corporate governance is the key for this relationship.[22] We add to the literature the finding that disclosure of income taxes might also play a role in the relationship between tax avoidance strategies and firms' value.

The remainder of the paper is organised as follows. Section 3.2 presents the theory and existing empirical evidence on disclosure, tax avoidance, and firm value. Section 3.3 details the data and research design. In Section 3.4, the empirical results, additional analyses, and robustness checks are described and Section 3.5 summarises and concludes the paper.

3.2. Literature Review

The activity of tax avoidance is broadly defined in the literature as being "anything that reduces the firm's cash effective tax rate over a long time period" (Dyreng, Hanlon, & Maydew, 2008). Tax avoidance strategies increase firms' organisational complexity in several ways. For instance, an increase in subsidiaries located in different jurisdictions allow firms to manage taxable income in each jurisdiction. Firms that avoid paying more taxes exhibit poorer transparent information environments (Balakrishnan et al., 2012; Wang, 2011) as the increase in complexity decreases (increases) transparency (opacity).

In the literature, the effect exerted by tax avoidance on firm value is somehow contradictory, due to different perspectives on corporate tax avoidance. The traditional perspective on corporate tax avoidance argues that when managers pursue tax avoidance strategies, they act in the shareholders' best interest. The inference is that tax avoidance

[22] The working paper version of Desai and Dharmapala (2009) provides a more detailed analysis on this issue than the published article in the *Review of Economics and Statistics*.

is a mechanism for transferring value from the State to shareholders, and therefore it is a value-enhancing strategy. The return-generating effect provides incentives for tax aggressive firms to hide tax-related information from the tax administration. Otherwise, tax audit assessments might offset the benefits of tax avoidance. The research of Robinson and Schmidt (2013) finds that aggressive tax avoidance leads to lower compliance with FIN 48 disclosure requirements with regards to uncertain tax benefits – these tax positions may be challenged by the tax administration. On this topic, for most firms lowering the corporate income tax payable "is only possible if they are willing to bear tax uncertainty" (Dyreng, Hanlon, & Maydew, 2015), and cash holdings are larger for these firms engaged in greater uncertainty (Hanlon, Maydew, & Saavedra, 2015). With a different focus, Wang (2011) develops an index of corporate transparency and finds that transparent firms avoid more taxes than opaque firms do, and that transparency increases firm value. In both studies (Robinson & Schmidt, 2013; Wang, 2011) the value enhancing effect of tax avoidance predominates.

However, a large amount of empirical research does not provide support for the traditional perspective on corporate tax avoidance. Empirical evidence is contradictory to this expectation, inferring that in general shareholders either penalise firms engaged in greater tax avoidance (e.g., Wahab and Holland (2012)), or they do not value tax avoidance (e.g., Desai and Dharmapala (2009)), and that any potential association between tax avoidance and firms' value varies according to corporate governance quality (Desai & Dharmapala, 2009), opacity (Wang, 2011), and also different methods of tax avoidance (Inger, 2014). The dichotomy between theory and empirical evidence triggered the development of an alternative perspective on corporate tax avoidance – the agency perspective.

The agency perspective on corporate tax avoidance takes into consideration the agency tension between managers and shareholders. Using US data, Desai and Dharmapala (2009) suggest that the effect exerted by tax avoidance on firms' value is significantly influenced by firms' corporate governance quality. The overall effect of tax avoidance on firms' value is not significant, although it is positive for "well"-governed firms. From Desai and Dharmapala (2009) we conclude that the traditional perspective on corporate tax avoidance holds for firms that exhibit less agency tension between managers and shareholders. This rational pertains mostly to SMEs, where there is usually no separation between management and shareholders, although Desai and Dharmapala (2009) conclusions are drawn using a sample of 687 US large firms. Wahab and Holland (2012) findings for the UK also fit in with the agency perspective on corporate tax avoidance. Nonetheless, the effect of tax avoidance on firms' value is negative, when one considers either the entire sample, or subsamples of different levels of quality of corporate governance. For the authors, this divergence with Desai and Dharmapala (2009) might be explained by the fact that UK corporate governance mechanisms are inefficient per se, or because there is insufficient tax-related information available to be appreciated by shareholders. Still on the subject of how shareholders value tax avoidance, Wang (2011) sheds light on the fact that shareholders place a premium on tax avoidance, but that this premium decreases as firms become more opaque. Frank, Lynch, and Rego (2009) find that market participants overprice tax-reporting aggressiveness, as measured by discretionary permanent differences.

Shareholders take a negative view towards some tax avoidance strategies, as they may be a sign of involvement in tax fraud or tax shelters, amongst others (Hanlon &

Slemrod, 2009). Additional disclosure offsets the increase in information asymmetry from tax avoidance. Consequently, firms can reduce the cost of equity capital and increase their market value of equity through disclosure, which results in an increase in shareholder wealth (e.g., Botosan (1997); Francis, Khurana, and Pereira (2005)).

As pointed out by Dhaliwal, Gleason, and Mills (2004), the closure of tax accounting is one of the last procedures carried out before the completion of annual reports and earnings announcement, at which stage managers can be pressured to engage in aggressive tax avoidance as a way of meeting earnings forecasts. On the other hand, managers avoid disclosing information that might create a difficult precedent that has to be maintained in the future (Graham, Harvey, & Rajgopal, 2005). This implies that disclosure is expected to be stable throughout time (Botosan, 1997), which is indeed coherent with a major characteristic of accounting information – comparability. Independent of this finding, Balakrishnan et al. (2012) find that managers increase the amount of disclosure of tax-related information, in order to mitigate transparency problems that arise from tax avoidance. That is to say, transparency problems are lower when tax aggressive firms provide additional disclosures. Moreover, there is evidence in the literature that top executives significantly influence firms' voluntary disclosures (Bamber, Jiang, & Wang, 2010).

For the purpose of this study, information asymmetry relates to information regarding income taxes under IFRS adopters. The research of Kvaal and Nobes (2013) focusses on some disclosure requirements of IAS 12. In a cross-country comparison, covering 161 large firms in five countries (Australia, France, Germany, Spain, and the UK), they surprisingly find that IFRS reporting practices vary systematically between countries, and even industries. Highly varied practices exist with regards to the

reconciliation of tax expense. Even within countries, there are different patterns of disclosure of income taxes between firms. Indeed, there is no clear evidence as to whether higher disclosure of income taxes is more common among firms in countries which have a long tradition, or experience, in accounting for income taxes (Kvaal & Nobes, 2013).

The literature generates mixed conclusions regarding shareholders' market response to disclosure. One stream of the literature suggests that shareholders reward firms for engaging in more tax avoidance and for providing less disclosure about tax issues (Robinson & Schmidt, 2013). Another stream of the literature suggests somehow to the contrary. For instance, Hanlon and Slemrod (2009) focus on the propagation of news about tax aggressiveness. They find that, on average, firms' stock price declines after receiving news about firms' involvement in tax shelters. That is to say, tax-sheltering strategies are penalised by market participants, although this penalisation is significantly lower in the case of firms that engage in less tax avoidance.

Furthermore, the literature argues that firms report a different income, depending on the audience (e.g., Shackelford, Slemrod, and Sallee (2011)). In this case, the aim is to serve each audience with information that is in the shareholders' (or the managers') best interests. Regarding the difference between book income and taxable income (or book-tax differences), Dhaliwal, Kaplan, Laux, and Weisbrod (2013) suggest that aggregate book-tax differences have information content to shareholders. Nevertheless, Raedy, Seidman, and Shackelford (2011) find that shareholders largely ignore differences between book and taxable income detailed in the tax footnotes, and that they focus more on the detailed book-tax differences in the statements of deferred tax positions and tax reconciliations. The existence of differences between book income and

taxable income is justified by several reasons. For instance, book-tax differences exist as financial accounting objectives differ from tax objectives; or account of opportunistic reporting (Blouin et al., 2007).

Another stream of literature studies whether investors incorporate allowances for deferred tax positions in the share price. To quote from of these studies, Amir, Kirschennheiter, and Willard (1997) find mixed evidence, whilst Ayers, Laplante, and Schwab (2011) and Dhaliwal et al. (2013) provide evidence that investors partially value allowances for deferred taxes, and Kumar and Visvanathan (2003) suggest that managers communicate expectations about future outcomes through the valuation of deferred tax allowances. Furthermore, Amir et al. (1997) find relevance for the separation of deferred taxes into several components in the year prior to FAS 109 implementation, although there is no evidence for the post-implementation period. Indeed, deferred taxes appear to explain cross-section variations in firms' value (Amir et al., 1997). Ayers et al. (2011) find positive association between US firms' current tax deferral and stock returns around the period of 10-K release, and that current tax deferral is positively related to future profitability (Ayers et al., 2011). Dhaliwal et al. (2013) focussed on loss-making firms. They find evidence that tax expenses and other disclosures are informative about earnings prospects and the persistence or reversal of accounting losses, and that this might be associated with the stock values of these loss-making firms. Overall, they suggest that investors of loss-making firms understand decisions related to valuation allowances, but that they not fully incorporate information in the footnotes disclosures that is related to tax expenses and other disclosures. Through an event study, Kumar and Visvanathan (2003) found that market participants

are sophisticated in interpreting firms' disclosure, and that investors incorporate allowance disclosures in their reassessment of earnings prospects.

Bauman and Shaw (2005) focussed on the estimates of the effective tax rate disclosed in interim financial statements, and find that this information is useful for predicting forthcoming earnings, although stock values do not reflect this tax-related information. One justification for this is that changes in estimates of effective tax rate are difficult to interpret to most users of firms' financial information.

In parallel with the act of disclosing information on income taxes, a longstanding question with respect to the literature remains – whether corporate tax returns should be public, or not (Lenter, Slemrod, & Shackelford, 2003). The disclosure of tax returns and the disclosure of tax-related information in the notes to the financial statements share similar pros and cons. In Japan, from 1950 until 2004, the tax administration required, above certain taxable income threshold, the public disclosure of individual and corporate tax information. Hasegawa, Hoopes, Ishida, and Slemrod (2013) find that firms that were close to the disclosure threshold tended to manipulate earnings, in order to avoid disclosure.

3.2.1. Research Hypotheses

In the first analysis, two distinct rationales might hold. Firstly, a firm engaged in more tax avoidance has inevitably more operations that qualify for requirements of disclosure of income taxes mandated by IAS 12, and thus we might expect a positive association between tax avoidance on disclosure of income taxes. Likewise, in the presence of tax avoidance strategies, disclosure is required to deal with transparency issues – the agency perspective. Secondly, firms engaged in more tax avoidance have

incentives to hide information from the tax administration and consequently disclose less information about income taxes – the traditional perspective. We follow the agency perspective on corporate tax avoidance and hypothesise the following:

H1: The disclosure of income taxes in the notes to the financial statements is positively associated with firms' level of tax avoidance.

An extensive debate in the literature discusses whether, how, and to what extent tax avoidance influences firms' value. This discussion is far removed from this study, as tax avoidance is precisely the mechanism through which disclosure of income taxes might affect firm value. Desai and Dharmapala (2009) show that the quality of corporate governance might be the key to understanding this relationship. Notwithstanding the discussion as to whether corporate governance shapes this relation, the disclosure of tax-related information should not directly influence firms' value. As pointed out by Raedy et al. (2011), the theory is not rich enough to address detailed hypotheses about "which bits of information imbedded in the BTD hodgepodge of accounts matter, to whom they matter, and why they matter."[23]. Indeed, they suggest that shareholders ignore some disclosure in the tax footnotes. The inference is that disclosure of income taxes, *per se*, is a small, or negligible part of the valuation process. However, when the moderator effect of corporate tax avoidance is taken into consideration, we expect an indirect and significant effect of disclosure of income taxes on firms' value. Thus, we address the following two hypotheses:

H2: The disclosure of income taxes in the notes to the financial statements is not directly associated with firms' value.

[23] Available in an older version of Raedy et al. (2011) study, which was entitled as "Book-Tax Differences: Which Ones Matter to Equity Investors?".

H3: The influence of disclosure of income taxes on firms' value varies with the level of tax avoidance.

3.3. Data and Research Design

3.3.1. Sample Selection

This study carries out a European comparison of IFRS adopters, covering 185 non-financial firms listed in the main stock indexes of 8 European countries (Table 3.1): Belgium, France, Germany, Greece, Italy, the Netherlands, Portugal, and Spain. The reference year is 2012 and it combines data from different sources, although most of firm level data is obtained from the Thomson Reuters Datastream (see Table 3.2 for variables description).

3.3.2. Measuring Disclosure of Income Taxes

We develop a disclosure index based on hand-collected data from IAS 12 (*Income Taxes*) disclosure requirements, along the lines of Robinson and Schmidt (2013) work for FIN 48. Specifically, we assess each point of IAS 12 disclosure requirements, as detailed in Appendix C. The index captures the disclosure of the major components of tax expense (income), which constitute the 8 points of paragraph 80 of IAS 12, as well as the other 11 points that are required in paragraph 81 to be disclosed separately. The score for each point of paragraphs 80 and 81 ranges from zero to one, depending on three characteristics: (i) quantitative disclosure; (ii) qualitative disclosure or explanation, and; (iii) comparative with prior years. The overall level of disclosure of income taxes is measured by *D_MANDATORY*, which is further rescaled to range between zero and one.

Panel A of Table 3.3 details descriptive statistics for the index of disclosure of income taxes. *D_MANDATORY* has a mean (median) of 0.444 (0.447), which means that the average firm discloses about 44 percent of the overall information required by IAS 12. This value is not surprising, as most firms do not have a wider enough range of operations to qualify for the disclosure requirements of IAS 12. For that reason, the following control variables are used to assess disclosure in the case of: (i) when firms take part in discontinued operations (*DISCOP*); (ii) anticipated (or interim) dividends (*IDIVID*), and; (iii) business combinations (*BCOMB*). These variables work as additional controls for the disclosure requirements of IAS 12 ¶81h-81k.

An important issue is the meaning of higher and lower levels of disclosure of income taxes. Higher disclosure means that firms comply more properly with requirements of disclosure of income taxes mandated by IAS 12, while lower scores might have a twofold meaning. Firms disclose less information than IAS 12 requirements, or firms do disclose information about income taxes, but it does not fit with IAS 12 requirements. For instance, firms disclose the components of tax expense (income) in a way makes it impossible to allocate the source of tax expense to each component of IAS 12 ¶80. Correlation analysis in Table 3.4 suggest that firms' size is an enhancing factor of mandatory disclosure of income taxes, as well as the role played by Big 4 statutory auditors (Table 3.4).

Additionally, some firms disclose information about income taxes beyond the disclosure requirements of IAS 12, and thus these firms are studied with particular interest. A dummy variable (*D_VOLUNTARY*) is created for these firms, taking the value 1 if the firm provides additional disclosure of income taxes. The typical case is represented by firms that provide extensive disclosure of recognized or unrecognized

temporary differences, whereas IAS 12 requires a straightforward disclosure. Additional disclosure of income taxes, hereafter referred as voluntary disclosure of income taxes, somehow distinguish the frontier between the mandatory disclosure and voluntary disclosure of income taxes.

About 19 percent of the sample is made up of firms that release voluntary disclosure of income taxes (*D_VOLUNTARY*). The literature argues that firms tend to provide additional disclosure in order to face earnings disappointments (Kasznik & Lev, 1995), or to mitigate the effect of bad news announcements (Chen, DeFond, & Park, 2002; Roychowdhury & Sletten, 2012). For instance, Chen et al. (2002) suggest that voluntary disclosures of balance sheet information's are more likely among 6 groups of firms, namely: those that report losses; those with more volatile stock returns; engaged in mergers or acquisitions; younger; in high technology industries, and; with larger forecast errors. A preliminary analysis of Table 3.4 suggests that firms reporting negative pre-tax earnings (*LOSS*), with shrinking sales over the past three years (*GROWTH*), that are riskier (*RISK*) and engaged in less tax avoidance (*LCETR*), are more likely to provide voluntary disclosure of income taxes.

3.3.3. Measuring Tax Avoidance

This study adopts the measures of tax avoidance from Dyreng et al. (2008) – the long-run cash effective tax rate (*LCETR*), which most consistently reflect firms' tax avoidance strategies by capturing the income tax paid to tax administration over a long-term horizon of five years. Combining a measure of disclosure of income taxes for 2012 with a proxy capturing firms' tax avoidance strategies over a five year horizon is

suitable, as a disclosure in annual reports that should remain stable over time (Botosan, 1997).

All proxies for tax avoidance are transformed as one minus the long-run cash effective tax rate, in order to make interpretation easier.[24] This procedure enhances understandability although it does not change the overall results. Higher values for the measure of tax avoidance correspond to aggressive tax avoidance, whilst firms engaged in less tax avoidance exhibit lower values for *LCETR*. The mean (median) of *LCETR* is 0.634 (0.712), which is slightly higher than that of studies focussed in the US (e.g., Gallemore and Labro (2015)). It means that average (median) cash tax paid to the tax administration is about 36.6 (28.8) percent of pre-tax earnings. As for robustness, we include alternative measures of tax avoidance – *LCETR*, scaled by statutory corporate income tax rate (*LCETR/CITR*) and *BOOK ETR*.

3.3.4. Measuring Firm Value

Valuing firms is nontrivial and requires a deep understanding of firms' current activities and their prospects, including new strategic opportunities. The uncertainty about future cash flows constrains the valuation for either investment purposes, or academic research. Tobin's Q ratio is often used as a proxy of firms' value in the accounting and finance literature (e.g., Desai and Dharmapala (2009); Inger (2014); amongst other studies). Most of the literature linking tax avoidance with firm value uses data at the end of the fiscal year. Instead, the market value of equity is measured in this study as being the average of the 3 month after the fiscal year end to reflect the lag in disclosing annual financial information to shareholders (Wahab & Holland, 2012).

[24] With this transformation, *LCETR* captures the 'cash' retention rate. Throughout this paper, we refer to tax avoidance as *TAVD*.

The mean (median) firm value is 1.37 (1.15) of total assets. Correlation analyses in Table 3.4 suggest that firm value is enhanced for firms reporting positive pre-tax earnings (*LOSS*), for smaller (*SIZE*), for less volatile firms (*RISK*), and also for more profitable firms (*PFTM*).

3.3.5. Research Design

To understand the determinants of the disclosure of income taxes (related to H1) we use the following equation through an ordinary least square regression:

$$DISCL_{i,c} = \beta_0 + \beta_1 TAVD_i + CONTROLS + \varepsilon_{i,c} \quad (1)$$

Equation (1) is estimated by using as the dependent variable (*DISCL*) either *D_MANDATORY* (mandatory disclosure), or *D_VOLUNTARY* (voluntary disclosure). To provide preliminary descriptive evidence on how tax avoidance might affect mandatory disclosure of income taxes these two variables are plotted in Figure 3.2. We find an ambiguous association. The coefficient of tax avoidance in this basic OLS regression is -0.016 (t-stat -0.50; p-value 0.619), which explains about 1.4 percent of the variability of disclosure of income taxes. From this analysis, there is no preliminary evidence to support H1.

Disclosure is influenced not only by firm level variables *i*, but also by variables at country level *c*. *CONTROLS* is a vector containing control variables detailed in Table 3.2. The reason for controls at firm level are as follows:

- Firms reporting negative pre-tax earnings (*LOSS*) have an incentive to release voluntary disclosure in order to justify poor performances (Chen et al., 2002). On the other hand, managers delay the release of bad news when compared with the timing of releasing good news (Kothari, Shu, & Wysocki, 2009).

- Some variables control for firms' life cycle (*SIZE*, and *GROWTH* in sales), as cash flow patterns vary systematically over firms' life cycle (Dickinson, 2011).
- The level of disclosure is significantly affected by firm size (*SIZE*), in which larger firms are more likely to provide voluntary disclosure (Botosan, 1997; Kasznik & Lev, 1995; Lang & Lundholm, 1993).
- A measure of firm's profitability is also included (*PFTM*).
- Listed firms in Europe are required to disclose audit and non-audit fees paid to statutory auditors, and among non-audit fees, tax consulting represents the larger share. Cook, Huston, and Omer (2008) find that higher tax fees paid to statutory auditors (*TAXFEE*) are associated with greater decrease in effective tax rate for those firms that missed consensus earnings forecasts.
- Not only are non-audit fees relevant, but also auditors size (e.g., Lennox (1999); Han, Kang, and Yoo (2012); Richardson, Taylor, and Lanis (2013)) Based on a sample of Australian firms, Richardson et al. (2013) suggest that firms less likely to be tax aggressive are, among others, those with a Big 4 statutory auditor and with a lower share of non-auditing service fees over the total fees paid. Klassen, Lisowsky, and Mescall (2015) also link Big 4 auditors with the level of tax aggressiveness.
- The literature suggest that tax aggressiveness and managers' disclosure choices can be influenced by analysts' earnings forecasts (Dhaliwal et al., 2004). Analysts play a role in monitoring firms' activities. They are the eyes of shareholders due to their monitoring activity, although at the same time, analysts target the standards for firms' performance. A greater number of analysts following firms (*ALALYST*) introduces pressure for managers to not only provide

adequate information to outsiders, but to also align interests with the principal one. Consistent with this inference, Lang, Lins, and Miller (2004) shows that analyst coverage enhances firm value.

- To control for disclosure of income taxes, we introduce variables that signal the frequency of specific words in annual reports, namely 'temporary difference' and 'deferred tax'. These linguistic indicators capture the use of key words in annual reports, and were considered in the literature after Core (2001) research. For instance, Law and Mills (2015) find that the frequency of negative words in firms' annual reports is positively associated with aggressive tax planning.
- Corporate governance might be assessed through three types of characteristics: ownership structure; board structure, and; compensation structure (e.g., Wahab and Holland (2012)). This study only focusses on board structure and ownership structure, due to the lack of data. As a measure of board structure, we introduce a variable which captures the number of members of the board of directors (*BOD*). The greater the portion of independent members on the board (*BODIND*), then the lower expected information asymmetry (Goh, Lee, Ng, & Ow Yong, 2014). Firms with more independent members as a portion of the board of directors are those most likely to focus on foreign tax management (Minnick & Noga, 2010). Moreover, the percent of shares held by institutional shareholders (*IOWN*) is the proxy for ownership structure, as in Desai and Dharmapala (2009) and Wahab and Holland (2012). The attraction to use *IOWN*, is that a greater number of institutional shareholders have more control over managers' opportunistic behaviour.

Most of the studies about disclosure focus in the US, and thus, do not take into consideration country variations regarding disclosure. As this study performs a cross-country comparison, it thus attempts to capture specific characteristics of IFRS adopters in Europe. Similar to Kvaal and Nobes (2013) conclusions, the level of disclosure of income taxes appears to vary systematically between European countries (Figure 3.1). Firms located in the southern European countries exhibit somewhat lower disclosure of income taxes than those located in other European countries covered in the sample. The difference between these two groups is robust (t-stat 6.192; p-value 0.000).[25] Moreover, the group of IASB founders in the sample exhibit higher disclosure of income taxes (t-stat 4.881; p-value 0.000).[26] Preliminary analyses suggest that institutional settings might drive the level of disclosure of income taxes. There are indeed, two controls at country level:

- We introduce a country index of creditor protection (*C_RIGHTS*) from Djankov, McLiesh, and Shleifer (2007). In the words of Leuz, Nanda, and Wysocki (2003), "strong and well-enforced outsider rights limit insiders' acquisition of private control benefits, and consequently, mitigate insiders' incentives to manage accounting earnings, because they have little to conceal from outsiders".
- The culture of a country is taken into consideration. Similar to Robinson and Slemrod (2012), we include a measure of trust in politicians (*TRUST*) as proxy for the culture of a country, which is sourced from The Global Competitiveness Reports of World Economic Forum.

[25] The first group consists of Greece, Italy, Portugal and Spain, while Belgium, France, Germany, and the Netherlands comprise the second group.

[26] France, Germany, and the Netherlands founded the IASC, which then became the IASB. The non-IASB founders group includes Belgium, Greece, Italy, Portugal, and Spain.

The previous literature focussing on the effect exerted by firms' level of tax avoidance on firms' value is not consensual. It depends on the perspective of corporate tax avoidance. Aside from this mixed evidence, among IFRS adopters the effect exerted by disclosure of income taxes on firm value is unknown to date. To test H2 and H3 – whether disclosure of income taxes influences firm value, we estimate:

$$FV_{i,c} = \gamma_0 + \gamma_1 TAVD_i + \gamma_2 DISCL_i + \gamma_3 (DISCL_i \times TAVD_i) + CONTROLS + v_{i,c} \qquad (2)$$

We are interested in understanding whether disclosure of income taxes has either a direct effect on firm value (H2), or an indirect effect (H3). The level of tax avoidance is the mechanism through which disclosure of income taxes might indirectly affect firm value. This effect is captured by the interaction of *DISCL* on *TAVD*. The same controls as in equation (1) are used, except controls specific for disclosure scores.

In Figure 3.3 and Figure 3.4 we plot firm value against tax avoidance and disclosure of income taxes, respectively. The measure of tax avoidance exhibit positive association with firm value (Figure 3.3). The coefficient of tax avoidance in this basic OLS regression is 0.481, with statistical significance (t-stat 2.11), and explains about 2.4 percent of firm value variability. On the other hand, Figure 3.4 evidences that disclosure of income taxes does not have an effect on firm value. The coefficient of disclosure of income taxes is -0.357, but this is not statically significant (t-stat -0.66; p-value 0.509). From this latter analysis, there is no preliminary evidence to support H2.

3.4. Empirical Results

3.4.1. Mandatory Disclosure of Income Taxes: Determinants

Table 3.5 presents the results on the determinants of mandatory disclosure of income taxes. In column (1) we perform equation (1), using firm level and specific controls for disclosure scores. The remaining columns add controls to equation (1). Consistent with H1, tax avoidance is statistically related to disclosure of income taxes. The signal is positive, which means that firms engaged in more tax avoidance are more likely to disclose more mandatory information of income taxes. This effect remains strong, with the inclusion of auditing and monitoring controls, governance controls, as well as institutional controls. These results are robust to support the stream of literature that claims that firms have incentives to enhance firms' transparency, due to the their engagement in risky activities (e.g., Wang (2011); Balakrishnan et al. (2012)).

Less profitable and larger firms appear to disclose more mandatory information about income taxes (Table 3.5). In addition, linguistics apparently play a role in the level of disclosure, as suggested by the frequency that the term "deferred tax" is used in firms' annual reports. In the setting estimated, variables other than firm specific appear to significantly influence disclosure of income taxes. Stronger creditor protection (*C_RIGHTS*) enhances disclosure of income taxes. It should be added that literature argues that outsiders protection influences earnings management and endogenously determines the quality of information reported (Leuz et al., 2003). On the other hand, mandatory disclosure of income taxes is higher in countries with more *TRUST* in lawmakers (politicians), which suggests a certain pattern of disclosure among countries, which provides support to Kvaal and Nobes (2013) findings.

3.4.2. Voluntary Disclosure of Income Taxes: Determinants

Table 3.6 presents the results for the determinants of voluntary disclosure of income taxes. Mandatory disclosure is expected to be stable throughout time, whereas voluntary disclosure might vary in the short run. It should be noted that conclusions are drawn using data just for 2012. In all specifications, results suggest that tax avoidance is not associated with voluntary disclosure of income taxes. Larger firms are those more likely to disclose voluntary information of income taxes. The same conclusion fits for firms with reducing sales, and also for firms reporting negative pre-tax earnings (column 3). This result fits with the literature, which claims a trend of more releases to the market to justify (or anticipate) poor performances, or bad news (e.g., Chen et al. (2002); Roychowdhury and Sletten (2012)). Both the auditing and external monitoring from analysts, as well as the level of investor protection appear to have no effect on the decision to disclose voluntary tax information.

3.4.3. Disclosure of Income Taxes: Effect on Firm Value

Table 3.7 details the effects of disclosure of income taxes on firm value. The first column reports the results of the baseline regression (simplified version of equation 2), exclusively including the direct effect of disclosure of income taxes on firm value, aiming to test H2. Moving to the right, in columns (2) through to (4), we introduce the indirect effect of disclosure of income taxes on firm value through the interaction with firms' level of tax avoidance. Directly, disclosure of income taxes does not affect firms' value (column 1). The direct effect of disclosure of income taxes on firm value remains not statistically significant with different sets of controls (not reported), which confirms H2.

The test of H3 is reported in columns (2) through to (4), in which the ambiguous effect described above might be offset by firms' level of tax avoidance. Results suggest that tax avoidance exerts a negative influence on firm value, which is in contrast with Desai and Dharmapala (2009), and is coherent with Wahab and Holland (2012). Regarding our main variables of interest, the coefficient of the index of mandatory disclosure of income taxes and its interaction with the level of tax avoidance are statistically significant in all estimations. Estimations presented in columns (2) through to (4) show a crossover interaction, which means that for tax aggressive firms, higher disclosure leads to larger firm value (Figure 3.5). On the contrary, for less tax aggressive firms, the increase in disclosure of income taxes decreases firm value. These findings are consistent with shareholders valuing tax avoidance activities with less scepticism in the presence of greater mandatory disclosure of income taxes. Regarding voluntary disclosure, the coefficient on *D_VOLUNTARY* is not statistically significant, although the signal suggests the opposite effect to that of mandatory disclosure. Voluntary disclosure of income taxes decrease firms' value. This is coherent with the view that voluntary disclosure about income taxes reveals excessive information of corporate strategies, which in turn mitigates the benefits of avoiding taxes.

3.4.4. Additional Analyses

The indirect relation between disclosure of income taxes and firms' value might vary significantly across the tax avoidance distribution. Armstrong, Blouin, Jagolinzer, and Larcker (2015) focussed on governance characteristics and find different effects in the upper and lower tails of tax avoidance distribution. Is there any difference between less and more tax aggressive firms? Section 3.4.3 above somehow answers this question. However, Table 3.8 complements these conclusions. The sample is split into three

groups. In Panel A, the first group (column 1) comprises the bottom 25% in terms of tax avoidance, while column (3) comprises the 25% of firms that exhibit a higher level of tax avoidance. Column (2) comprises the remaining 50% observations. Panel B uses non-hierarchical clustering to split the sample, in which firms are grouped into three groups by nearest mean. From here onwards, controls for corporate governance are not considered, as they showed no statistical significance and also there is no data for all firms. Results in both Panels of Table 3.8 suggest that the indirect relation between disclosure of income taxes and firms' value is higher for tax aggressive firms.[27] We address two interpretations. Firstly, there is no usefulness of tax information for firms not engaged in tax avoidance strategies (column 1). Secondly, shareholders view tax aggressive firms with less scepticism in the presence of more information about income taxes. Somehow, disclosure reveals tax avoidance, mitigating information asymmetry, and thus enhancing firms' value.

Desai and Dharmapala (2009) argue that the effect exerted by tax avoidance on firms' value varies systematically with the strength of corporate governance. They suggest that market participants value tax avoidance with scepticism due to the complexity inherent to these activities, although such scepticism can be overcome with high quality of governance. Both Desai and Dharmapala (2009) and Wahab and Holland (2012) use the fraction of firm's shares owned by institutional shareholders as a proxy to assess the quality of corporate governance. The justification to use this proxy is simple. Institutional owners devote more scrutiny over managers' activities, which mitigates managerial diversion. Thus, our sample is split by the median of the percentage of institutional ownership (*IOWN*). Additionaly, the analysis is

[27] Clustering into four groups (low, medium-low, medium-high, and high level of tax avoidance) provides similar results.

complemented using the percentage of shares held by insiders (*INSIDER*) as an alternative measure for the quality of corporate governance.

Columns (1) to (2) of Table 3.9 summarise these analyses. For "well"-governed firms (column 1) neither mandatory disclosure, nor voluntary disclosure influences firms' value. Firms should exhibit higher alignment of interest between the agent and the principal with more institutional ownership, and therefore disclosure of income taxes and tax avoidance are not influential to assess firms' value. Thus, the rationale of our results is that disclosure is negligible as the governance is strong. On the contrary, for firms other than "well"-governed results are coherent with the original findings (column 2). Results remain robust with the percentage of insider ownership as an alternative proxy for the quality of corporate governance (column 3 and 4 of Table 3.9).

IAS 12 requires separated disclosure on income taxes which is related to each component of other comprehensive income (OCI), either in the statement of OCI or in the notes. Findings in the literature on the relevance of OCI are mixed. For instance, Dhaliwal, Subramanyam, and Trezevant (1999) do find no support for the argument that comprehensive income is a better measure of performance than net income. Eberhartinger and Lee (2014) find no useful relevance of deferred tax information in OCI in an experimental environment with students, financial professionals, and practitioners. On the other hand, Biddle and Choi (2006) suggest that comprehensive income dominates other measures of income in explaining equity returns. Also Kubota, Suda, and Takehara (2011) find information in OCI useful, as the stock market reacts to information on specific items of OCI. To focus on information in the OCI, we use the scoring of IAS 12 ¶'81-ae' as a measure of mandatory disclosure of income taxes (Table 3.10). Surprisingly, the indirect effect of disclosure of income taxes on firms'

value, through the interaction with firms' tax avoidance, is statistically significant. The magnitude of the coefficient is smaller, although signals are the same as the estimations in Table 3.7. Therefore, we conclude that required disclosures in OCI might capture a portion of the effect of disclosure of income taxes on firms' value.

3.4.5. Robustness Checks

As for robustness in Table 3.11, we include country specific effects in all estimations. This procedure has some caveats in samples with few observations per country. In columns (3) and (4) a random effects specification is used, derived from the results of the Hausman test. The results in Table 3.11 are robust, using either random effects or fixed effects.

Alternative measures of tax avoidance are used in Table 3.12. Specifically, *LCETR* scaled by one minus the statutory corporate income tax rate (*CITR*), and the book effective tax rate (*BOOK ETR*). Because corporate tax burden varies between countries, *LCETR*/*CITR* captures the real tax avoidance within a country. Results are robust either with the *LCETR*/*CITR* as proxy for tax avoidance (Panel A), or with tax avoidance measured by *BOOK ETR* (Panel B).

Additional controls for the institutional setting are used, although they are not reported, as results are very similar. Additional controls are: (i) a measure of country-level tax evasion; (ii) a measure of the efficacy of the Board of Directors at country level; (iii) the extent and effect of taxation on the incentives to work and invest in a country; (iv) strength of auditing and reporting standards in each country; (v) the level of dependency of tax rules on accounting rules (book-tax conformity); (vi) location – southern or central Europe, and; (vii) IASB founder. The inclusion of

different combinations of contemporaneous and lagged observations for all variables listed above does not influence previous results. Lagged values aim to account for the lag between institutional changes and real implications on firms' activities.

3.5. Conclusions

The first aim of this study is to understand what drives disclosure of income taxes under IAS 12 disclosure requirements. Due to specificities of our hand-collected data from annual reports, we were able to distinguish between mandatory and voluntary disclosure of income taxes. Tax avoidance appears to exert a positive effect on mandatory disclosure of income taxes. That is to say, firms engaged in more tax avoidance are more compliant with mandatory requirements, as set out in IAS 12. Larger firms and less profitable ones are more likely to disclose more mandatory information on income taxes. With regards to voluntary disclosure of income taxes, tax avoidance does not exert a significant effect. Moreover, our results suggest that firms providing voluntary disclosure of income taxes are more likely to exhibit declining sales.

In this study we also examine whether disclosure of income taxes affects firms' value, and whether this relation might be driven by firms' level of tax avoidance. Therefore, we test to see whether there is a direct or an indirect effect of disclosure of income taxes on firm value. We expect tax avoidance to be the mechanism by which an indirect effect might hold. When the direct and the indirect effects of disclosure of income taxes on firms' value are computed, we find that there is no evidence to support the direct effect, whereas the indirect effect is statistically significant. The disclosure of income taxes in the notes to the financial statements, *per se*, is not valued by investors.

Nonetheless, results differ when the interaction (or moderator effect) with firms' tax avoidance is taken into consideration. Among tax aggressive firms, higher firm value is found in those firms disclosing more mandatory information about income taxes. In conclusion, corporate tax avoidance strategies increase opacity, which in turn negatively influence firm value. Investors perceive such activities with scepticism, due to potential rent diversion. The disclosure of income taxes mitigates this negative effect, especially for firms that avoid paying more taxes. The indirect relation is not found for firms with a higher quality of corporate governance. For this group of "well"-governed firms, shareholders do not value either mandatory disclosure of income taxes, or tax avoidance. The rationale behind this result is that shareholders are not concerned about tax avoidance strategies if governance is strong, as chances of managerial opportunism and rent diversion are lower.

Collectively, findings in this paper add an important contribution to the current debate on how firms' level of corporate tax avoidance influence firms' value (e.g., Desai and Dharmapala (2009)). While most of previous literature focusses on quality of corporate governance as being the key to explaining this relation, we add the finding that disclosure of income taxes in the notes to the financial statements might also play a role in explaining the relation between firms' tax avoidance strategies and firms' value.

3.6. References

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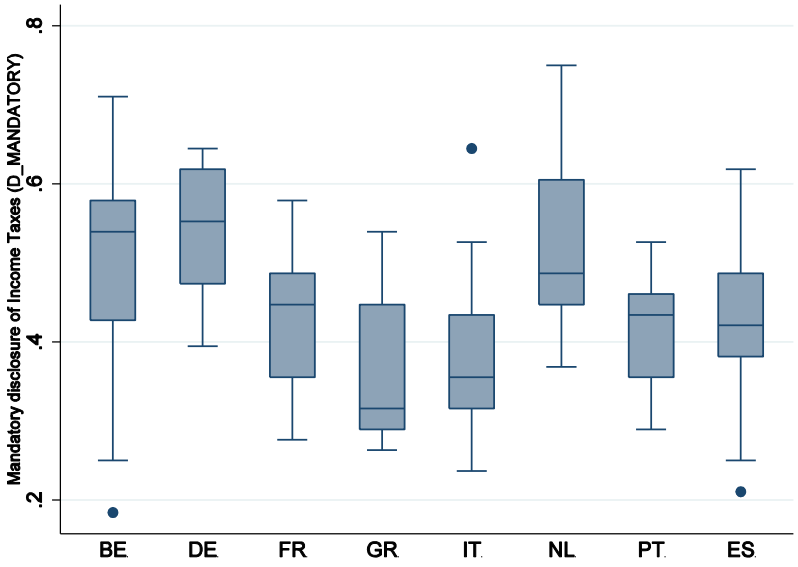
Appendix B. Tables and Figures

Table 3.1: Number of firms by country (fiscal year of 2012)

Country	Index	Listed firms	Financials	No. of firms
Belgium	BEL 20	20	-4	16
France	CAC 40	39	-4	35
Germany	DAX 30	30	-5	25
Greece	ATHEX Large Cap	25	-8	17
Italy	FTSEMIB	40	-12	28
Netherlands	AEX 25	25	-2	23
Portugal	PSI 20	20	-5	15
Spain	IBEX 35	34	-8	26
Total		233	-48	185

Figure 3.1: Country variation on mandatory disclosure of income taxes

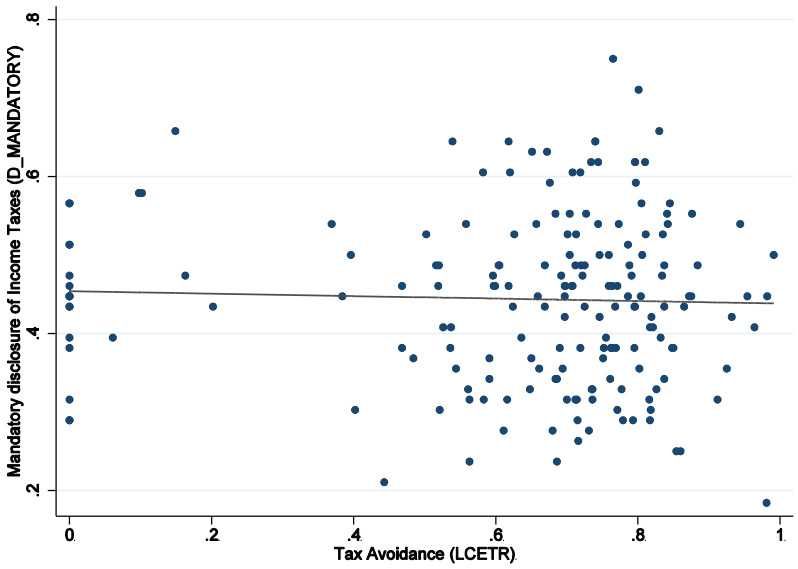
This figure plots the distribution of the index of mandatory disclosure of income taxes across countries.



Source: Authors

Figure 3.2: Test of H1 (Determinants): mandatory disclosure of income taxes and tax avoidance

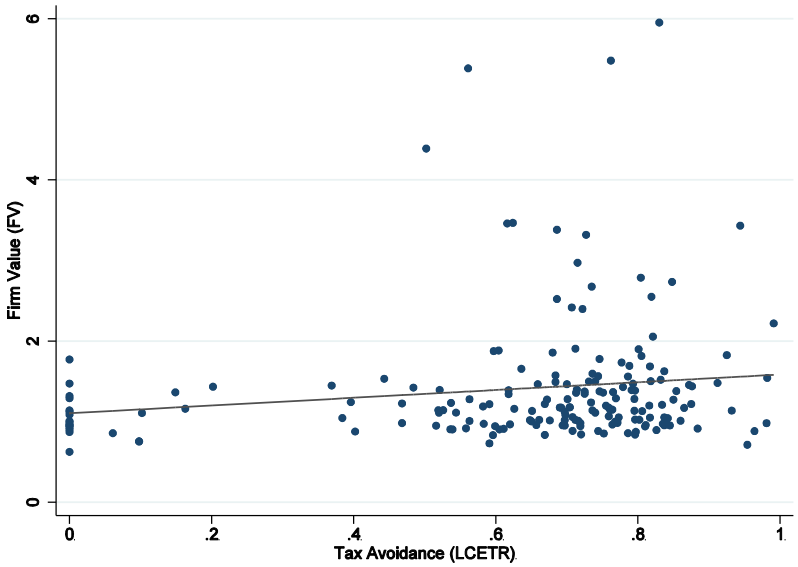
This figure plots the relationship between the index of firm's mandatory disclosure of income taxes (*D_MANDATORY*) and firm's level of tax avoidance (*LCETR*). The fitted line is the OLS regression of *D_MANDATORY* over *LCETR*. The corresponding coefficient on *LCETR* is -0.016 (*t-stat* -0.50; *p-value* 0.619), and means no support for a linear relation between tax avoidance and mandatory disclosure of income taxes.



Source: Authors

Figure 3.3: Firm value and tax avoidance

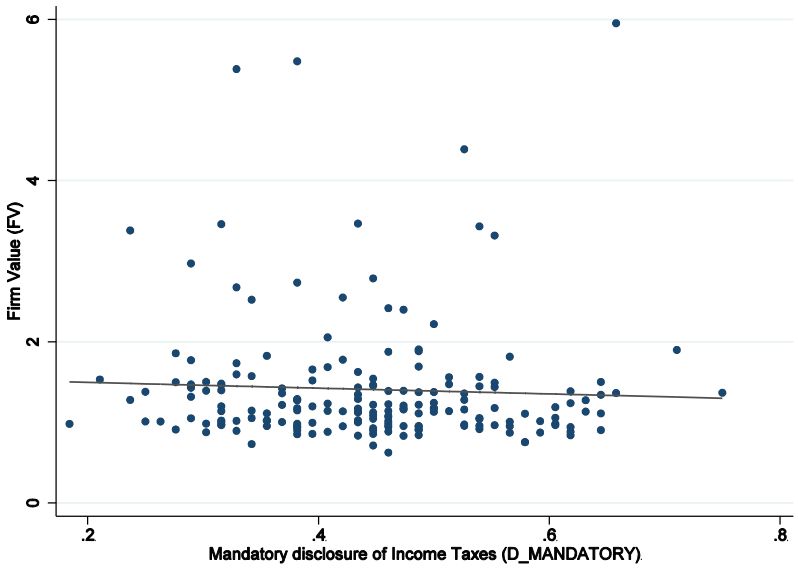
This figure plots the relationship between firm's value (*FV*) and firm's level of tax avoidance (*LCETR*). The fitted line is the OLS regression of *FV* over *LCETR*. The corresponding coefficient on *LCETR* is 0.481 (*t-stat* 2.11; *p-value* 0.036), and means that firms engaged in tax avoidance strategies are more likely to exhibit higher firm value.



Source: Authors

Figure 3.4: Test of H2 (Consequences): firm value and mandatory disclosure of income taxes

This figure plots the relationship between firm's value (*FV*) and the index of firm's mandatory disclosure of income taxes (*D_MANDATORY*). The fitted line is the OLS regression of *FV* over *D_MANDATORY*. The corresponding coefficient is -0.357 (*t-stat* -0.66; *p-value* 0.509), which suggest no statistical relation between mandatory disclosure of income taxes and firm value.



Source: Authors

Table 3.2: Data and variables construction

Variable	Source	Definition
Disclosure measures (*DISCL*)		
Mandatory disclosure		
D_MANDATORY	b	Index of mandatory disclosure of income taxes under IAS 12 requirements. It comprises a score between 0 and 1 for all the 8 points of IAS 12 ¶80, and for all 11 points that are required in IAS 12 ¶81 to be disclosed separately. *D_MANDATORY* is further rescaled to range between 0 and 1. For detailed explanation, see Appendix C.
Voluntary disclosure		
D_VOLUNTARY	b	Additional disclosure of income taxes; a dummy variable taking the value 1 for firms that disclose more information in the notes to the financial statements than IAS 12 ¶80 & ¶81 disclosure requirement, and 0 otherwise.
Other scores		
D_OCI	b	Index of mandatory disclosure of income taxes under IAS 12 requirements using only the information related to other comprehensive income. It comprises a score between 0 and 1 for IAS 12 ¶81-ae. For detailed explanation, see Appendix C.
Tax avoidance measures (*TAVD*)		
LCETR	b	Long-run cash effective tax rate, measured as one minus the sum of cash tax paid over a five-year horizon divided by pre-tax earnings over the same period. Firms with accumulated negative pre-tax earnings take the value 0. *LCETR* is winsorized at 0 and 1.
LCETR/CITR	b-e	*LCETR* scaled by one minus statutory corporate income tax rate by country, over the same period.
BOOK ETR	b	Book (or GAAP) effective tax rate, measured as one minus income tax over pre-tax earnings. Firms with negative pre-tax earnings take the value 0. *BOOK ETR* is winsorized at 0 and 1.
Firm value measure		
FV	a	Tobin's Q, measured as [(book value of total assets – book value of equity + market value of equity)/book value of total assets]. Market value of equity is measured as the monthly average between the accounting year-end and the third month after.
Controls		
LOSS	a	Loss, a dummy variable taking the value 1 for firms with negative pre-tax earnings, and 0 otherwise.
SIZE	a	Firm size, measured as log of total assets.
PFTM	a	Profit margin, measured as net income divided by total sales.
RISK	a	Risk, standard deviation of monthly stock returns over previous 36 months.
GROWTH	a	Sales growth, measured as the 3-years average sales growth.
BIG4	b	Big 4 auditor, a dummy variable taking the value 1 if the firms' Statutory Auditor is a Big 4 firm (Deloitte, EY, KPMG, or PwC), and 0 otherwise.
TAXFEE	b	Portion of tax consulting fees, measured as tax consulting fees over total fees paid to Auditors.
ANALAYST	b	Analysts coverage, measured as the log of the number of analysts following each firm.
BOD	b	Size of board of directors, measured as the number of members of the board of directors.
BODIND	b	Independent members, measured as the portion of independent members in the board of directors.
IOWN	a-b	Percent of firms' shares outstanding held by institutional shareholders.
INSIDER	a-b	Percent of firms' shares outstanding held by insiders. It includes shares held by directors, entities or persons owning more than 10% of firms' voting rights, and entities or persons with less than 10% but with representative members in the board of directors.
'temporary difference'	b	Frequency of 'temporary difference', measured as the frequency of 'temporary difference' in annual report over the maximum observation in the sample.
'deferred tax'	b	Frequency of 'deferred tax', measured as the frequency of 'deferred tax' in annual report over the maximum observation in the sample.
DISCOP	b	Discontinued operations, a dummy variable taking the value 1 for firms with discontinued operations in the reporting year, and 0 otherwise.
IDIVID	b	Anticipated dividend, a dummy variable taking the value 1 if the firm proposes to

		pay interim dividends or dividends before the financial statements are authorised for issue, and 0 otherwise.
BCOMB	b	Business combination, a dummy variables taking the value 1 for firms with business combinations in the reporting year, and 0 otherwise.
C_RIGHTS	–	Country index of creditor rights from Djankov et al. (2007). The index is for 2002, and ranges from 0 to 4. Higher values indicate stronger creditor protection.
TRUST	c	Cultural variable related to trust in politicians, as used by (Robinson & Slemrod, 2012). Survey question: "Public trust in the financial honesty of politicians", 1 is very low and 7 very high.
OCI	b	Scoring of mandatory disclosure of income taxes related to other comprehensive income (under IAS 12). It comprises a score between 0 and 1 for IAS 12 ¶81-ae requirements.
EVASION	d	Size and development of tax evasion (in % of GDP) accounting for self-employment.
SAUDIT	c	Strength of auditing and reporting standards, measured in a scale between 1 (extremely weak) and 7 (extremely strong).
EBOD	c	Efficacy of corporate boards, which characterise corporate governance by investors and boards of directors. *EBOD* is measured in a scale between 1 (management has little accountability to investors and boards) and 7 (investors and boards exert strong supervision of management decisions).
EXTAX	c	Extent and effect of taxation, which measures the impact that the level of taxes exerts on incentives to work or invest. *EXTAX* is measured in a scale between 1 (significantly limits incentives to work or invest) and 7 (has no impact on incentives to work or invest).
i	–	Firm.
c	–	Country where the firm is listed.

Notes:

[a] Thomson Reuters Datastream, Thomson Reuters Eikon, and Reuters online market data.

[b] Hand-collected data from Annual Reports.

[c] The Global Competitiveness Report 2012-2013 (WEF – World Economic Forum).

[d] The Organisation for Economic Co-operation and Development (OECD)

[e] KPMG available online at: http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/ (Tax tools & resources).

Table 3.3: Descriptive statistics

Variable	*N*	*Mean*	*Standard Deviation*	*1st Quartile*	*Median*	*3rd Quartile*
Panel A: Disclosure of income taxes scores						
D_MANDATORY (1)	185	0.444	0.109	0.368	0.447	0.513
D_VOLUNTARY	185	0.189	0.393	0.000	0.000	0.000
Panel B: Tax avoidance and firm value measures						
LCETR	185	0.634	0.254	0.583	0.712	0.795
LCETR/CITR	185	0.902	0.365	0.818	1.012	1.128
BOOK ETR	185	0.744	0.196	0.660	0.745	0.868
FV	185	1.374	0.732	0.973	1.150	1.437
Panel C: Controls						
LOSS	185	0.146	0.354	0.000	0.000	0.000
SIZE	185	7.070	0.637	6.620	7.067	7.517
PFTM	185	0.065	0.102	0.016	0.052	0.108
RISK	185	0.091	0.036	0.065	0.084	0.108
GROWTH	185	0.076	0.120	0.014	0.067	0.110
BIG4	185	0.946	0.227	1.000	1.000	1.000
TAXFEE	185	0.087	0.134	0.000	0.044	0.122
ANALAYST	185	2.920	0.672	2.708	3.135	3.367
BOD	185	11.103	4.405	8.000	11.000	14.000
BODIND	185	0.327	0.272	0.000	0.300	0.540
IOWN	180	0.592	0.168	0.469	0.596	0.705
INSIDER	179	0.351	0.246	0.105	0.357	0.535
C_RIGHTS	8	1.750	1.035	1.000	2.000	2.000
TRUST	8	3.120	1.130	2.600	3.400	3.700

Notes:

This table reports the descriptive statistics of main variables used in the cross-country comparison. **Panel A** reports descriptive statistics for the indexes of disclosure of income taxes. **Panel B** reports descriptive statistics for two measures of tax avoidance and for the measure of firm value used in this study, while **Panel C** reports descriptive statistics for controls.

(1) Rescaled scores to range between 0 and 1.

Table 3.4: Correlation analyses

Variable		*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*	*(17)*	*(18)*
D_MANDATORY	*(1)*	1																	
D_VOLUNTARY	*(2)*	0.37*	1																
LCETR	*(3)*	-0.04	-0.15*	1															
LCETR/CITR	*(4)*	-0.04	-0.16*	0.99*	1														
BOOK ETR	*(5)*	0.04	0.15*	-0.17*	-0.18*	1													
FV	*(6)*	-0.05	-0.12	0.15*	0.16*	-0.01	1												
LOSS	*(7)*	0.11	0.23*	-0.69*	-0.69*	0.46*	-0.21*	1											
SIZE	*(8)*	0.37*	0.10	0.00	0.04	-0.14	-0.30*	-0.02	1										
PFTM	*(9)*	-0.17*	-0.14	0.49*	0.48*	0.00	0.22*	-0.51*	-0.08	1									
RISK	*(10)*	-0.12	0.16*	-0.34*	-0.38*	0.05	-0.27*	0.33*	-0.31*	-0.30*	1								
GROWTH	*(11)*	-0.03	-0.18*	0.13	0.14	-0.06	0.05	-0.07	0.08	0.02	0.00	1							
BIG4	*(12)*	0.21*	-0.01	-0.04	0.00	0.06	0.05	0.10	0.33*	-0.01	-0.32*	-0.04	1						
TAXFEE	*(13)*	0.03	0.05	-0.08	-0.06	0.11	0.10	0.10	-0.23*	-0.03	0.03	-0.12	0.13	1					
ANALYST	*(14)*	0.35*	-0.05	0.11	0.16*	-0.03	0.12	-0.09	0.64*	0.02	-0.52*	0.06	0.46*	-0.06	1				
BOD	*(15)*	-0.22*	-0.08	-0.04	0.00	-0.10	-0.09	0.02	0.16*	-0.10	-0.06	0.08	-0.03	-0.02	0.04	1			
BODIND	*(16)*	-0.23*	-0.13	-0.02	0.04	-0.14	-0.04	0.00	0.10	-0.01	-0.08	0.05	0.05	-0.07	0.09	0.39*	1		
IOWN	*(17)*	-0.21*	0.02	0.08	0.06	0.05	0.08	-0.06	-0.32*	0.09	0.08	-0.02	-0.11	0.03	-0.31*	0.14	-0.14	1	
INSIDER	*(18)*	-0.23*	0.04	-0.02	-0.04	0.00	0.04	-0.01	-0.26*	0.00	0.19*	0.02	-0.16*	0.10	-0.40*	0.20*	-0.09	0.82*	1

Notes:

Reported are univariate analyses. The symbol * represents significant level of 5%.

Table 3.5: Determinants of mandatory disclosure of income taxes

		Mandatory disclosure of income taxes (*D_MANDATORY*)			
	Sign	(1)	(2)	(3)	(4)
Firm level					
TAVD	?	0.069**	0.053**	0.069***	0.059***
		(0.026)	(0.018)	(0.013)	(0.015)
LOSS	+	0.035	0.004	0.031	0.011
		(0.021)	(0.029)	(0.022)	(0.031)
SIZE	+	0.050	0.047**	0.045**	0.047**
		(0.027)	(0.017)	(0.016)	(0.017)
PFTM	?	-0.133*	-0.169***	-0.144**	-0.154**
		(0.056)	(0.045)	(0.048)	(0.046)
RISK	?	-0.103	0.209	-0.072	0.087
		(0.269)	(0.335)	(0.316)	(0.329)
GROWTH	?	-0.077	-0.041	-0.070	-0.060
		(0.061)	(0.057)	(0.051)	(0.049)
Disclosure controls					
'temporary difference'	+	0.071	0.060	0.042	0.044
		(0.060)	(0.047)	(0.059)	(0.053)
'deferred tax'	+	0.071	0.108**	0.122**	0.119**
		(0.060)	(0.039)	(0.050)	(0.045)
DISCOP	+	0.037*	0.020	0.030*	0.022
		(0.018)	(0.015)	(0.016)	(0.016)
IDIVID	+	0.000	0.004	0.019	0.011
		(0.026)	(0.017)	(0.014)	(0.017)
BCOMB	+	0.039*	0.026	0.032*	0.029*
		(0.018)	(0.014)	(0.014)	(0.014)
Auditing and monitoring					
BIG4	+		-0.011	-0.009	-0.010
			(0.030)	(0.038)	(0.034)
TAXFEE	+		0.047	0.073	0.055
			(0.075)	(0.077)	(0.075)
ALAYST	?		0.000	0.016	0.000
			(0.015)	(0.017)	(0.016)
Governance					
BOD	?			-0.005**	-0.003
				(0.002)	(0.002)
BODIND	?			-0.090***	-0.036*
				(0.023)	(0.019)
IOWN	?			-0.045	-0.016
				(0.024)	(0.018)
Institutional					
C_RIGHTS	+		0.023**		0.014***
			(0.009)		(0.003)
TRUST	?		0.028**		0.023*
			(0.011)		(0.012)
Constant	?	-0.002	-0.115	0.086	-0.034
		(0.167)	(0.143)	(0.130)	(0.119)
N		185	185	180	180
Adjusted R^2		0.234	0.384	0.349	0.382

Notes: $D\_MANDATORY_{i,c} = \beta_0 + \beta_1 TAVD_i + CONTROLS + \varepsilon_{i,c}$

The dependent variable in all columns is: *D_MANDATORY* – index of mandatory disclosure of income taxes. Higher values of *D_MANDATORY* mean that firms disclose more tax-related information (mandated by IAS 12) in the notes to the financial statements. Independent variables are detailed in Table 3.2. Tax avoidance (*TAVD*) is measured by *LCETR*. Higher values of *TAVD* mean that firms are engaged in more tax avoidance. There is no available data of *IOWN* for 5 firms.

Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 3.6: Determinants of voluntary disclosure of income taxes

		Voluntary disclosure of income taxes (*D_VOLUNTARY*)			
	Sign	(1)	(2)	(3)	(4)
Firm level					
TAVD	?	0.165	0.150	0.158	0.140
		(0.203)	(0.195)	(0.194)	(0.194)
LOSS	+	0.228	0.197	0.256*	0.231
		(0.127)	(0.137)	(0.120)	(0.134)
SIZE	+	0.095	0.158*	0.179*	0.180*
		(0.051)	(0.081)	(0.089)	(0.092)
PFTM	?	0.041	-0.014	0.028	0.034
		(0.183)	(0.231)	(0.235)	(0.268)
RISK	?	2.024**	1.671	1.307	1.551
		(0.774)	(1.081)	(1.118)	(1.118)
GROWTH	?	-0.659***	-0.590***	-0.683***	-0.651**
		(0.143)	(0.153)	(0.190)	(0.188)
Disclosure controls					
'temporary difference'	+	0.028	0.036	0.110	0.119
		(0.214)	(0.222)	(0.199)	(0.203)
'deferred tax'	+	0.450***	0.525***	0.511***	0.499**
		(0.120)	(0.125)	(0.136)	(0.146)
DISCOP	+	-0.082	-0.108*	-0.111*	-0.119*
		(0.052)	(0.055)	(0.058)	(0.060)
IDIVID	+	-0.068	-0.063	-0.034	-0.043
		(0.062)	(0.066)	(0.056)	(0.060)
BCOMB	+	0.117*	0.108*	0.097	0.095
		(0.054)	(0.050)	(0.060)	(0.055)
Auditing and monitoring					
BIG4	+		-0.140	-0.179	-0.180
			(0.212)	(0.229)	(0.230)
TAXFEE	+		0.210	0.238	0.220
			(0.150)	(0.191)	(0.170)
ALAYST	?		-0.100	-0.051	-0.069
			(0.066)	(0.074)	(0.083)
Governance					
BOD	?			-0.011	-0.009
				(0.008)	(0.007)
BODIND	?			-0.088	-0.028
				(0.133)	(0.149)
IOWN	?			0.152	0.201
				(0.330)	(0.323)
Institutional					
C_RIGHTS	+		0.024		0.000
			(0.020)		(0.023)
TRUST	?		0.052**		0.039
			(0.021)		(0.022)
Constant	?	-0.938*	-1.155**	-1.148	-1.289
		(0.403)	(0.419)	(0.683)	(0.718)
N		185	185	180	180
Adjusted R^2		0.131	0.150	0.154	0.151

Notes: $D\_VOLUNTARY_{i,c} = \beta_0 + \beta_1 TAVD_i + CONTROLS + \varepsilon_{i,c}$

The dependent variable in all columns is: *D_VOLUNTARY* – a dummy variable taking the value 1 if the firm discloses voluntary information of income taxes in the notes to the financial statements, and 0 otherwise. Independent variables are detailed in Table 3.2. Tax avoidance (*TAVD*) is measured by *LCETR*. Higher values of *TAVD* mean that firms are engaged in more tax avoidance. There is no available data of *IOWN* for 5 firms.

Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 3.7: Effect of disclosure of income taxes on firm value

		Firm Value (*FV*)				
	Sign	(1)	(2)	(3)	(4)	(5)
Direct effect						
TAVD	-	-0.332***	-2.390**	-2.519**	-2.527**	-2.379**
		(0.083)	(0.925)	(0.790)	(0.824)	(0.757)
D_MANDATORY	-	0.798	-2.558*	-3.149**	-3.146**	-3.056***
		(0.593)	(1.213)	(0.918)	(0.911)	(0.838)
D_VOLUNTARY	?	-0.028	0.348	0.389*	0.392	0.262
		(0.137)	(0.202)	(0.203)	(0.208)	(0.225)
Indirect effect						
D_MANDATORY × *TAVD*	+		5.024**	5.217**	5.238**	5.095**
			(2.037)	(1.789)	(1.875)	(1.959)
D_VOLUNTARY × *TAVD*	?		-0.573	-0.503	-0.507	-0.450
			(0.365)	(0.344)	(0.349)	(0.402)
Firm level						
LOSS	-	-0.284**	-0.215**	-0.240*	-0.238*	-0.093
		(0.083)	(0.079)	(0.126)	(0.123)	(0.119)
SIZE	-	-0.572**	-0.568**	-0.803***	-0.804***	-0.778**
		(0.182)	(0.183)	(0.204)	(0.206)	(0.234)
PFTM	+	0.592*	0.725*	0.811**	0.818**	1.084**
		(0.283)	(0.319)	(0.307)	(0.308)	(0.340)
RISK	-	-8.183***	-8.851***	-5.827*	-5.836*	-5.442**
		(2.297)	(2.265)	(2.747)	(2.667)	(2.116)
GROWTH	+	0.612	0.801*	0.796*	0.797*	0.674*
		(0.333)	(0.406)	(0.359)	(0.371)	(0.343)
Auditing and monitoring						
BIG4	+			0.011	0.011	-0.015
				(0.107)	(0.109)	(0.147)
TAXFEE	?			-0.022	-0.020	-0.167
				(0.162)	(0.169)	(0.206)
ALAYST	?			0.463**	0.465**	0.501**
				(0.151)	(0.150)	(0.177)
Governance						
BOD	?					-0.002
						(0.020)
BODIND	?					-0.035
						(0.306)
IOWN	?					0.018
						(0.417)
Institutional						
C_RIGHTS	+				-0.003	-0.017
					(0.040)	(0.055)
TRUST	?				-0.001	-0.030
					(0.024)	(0.029)
Constant	?	6.015***	7.384***	7.686***	7.698***	7.429***
		(1.441)	(1.745)	(1.484)	(1.511)	(1.464)
N		185	185	185	185	180
Adjusted R^2		0.233	0.245	0.306	0.298	0.289

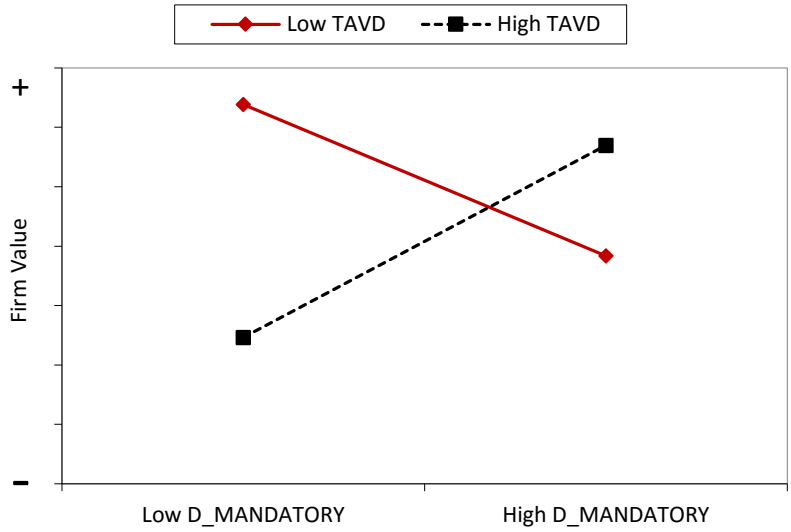
Notes: $FV_{i,c} = \gamma_0 + \gamma_1 TAVD_i + \gamma_2 DISCL_i + \gamma_3 (DISCL_i \times TAVD_i) + CONTROLS + v_{i,c}$

The dependent variable in all the specifications is: *FV* = Tobin's Q, which is a proxy to assess firm's value. While in column (1) only firm level variables are included, in column (2) interaction terms are included. Column (3) adds auditing and monitoring controls, while column (4) adds institutional controls. Column (5) presents the full specification, which includes governance controls. Interaction terms capture indirect effects and are related to H3. Independent variables are detailed in Table 3.2. Tax avoidance (*TAVD*) is measured by *LCETR*. There is no available data of *IOWN* for 5 firms.

Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Figure 3.5: Crossover interaction

This figure plots the crossover effect of firm's mandatory disclosure of income taxes and firm's level of tax avoidance on firm's value. Tax avoidance (*TAVD*) is measured by *LCETR*. The dashed line represents tax aggressive firms, while the solid line represents the effect of firm's engaged in less tax avoidance. Figure 3.5 illustrates that for firms engaged in more tax avoidance (dashed line), firm's value is expected to increase in the presence of more disclosure of income taxes.



Source: Authors

Table 3.8: Additional analyses: level of tax avoidance

		Level of Tax Avoidance (*TAVD*)		
		"Low" (Bottom 25%)	"Intermediate" (Q1 to Q3)	"High" (Top 25%)
	Sign	(1)	(2)	(3)
PANEL A:				
Direct effect				
TAVD	-	-1.566	-8.567*	-5.811**
		(2.264)	(4.018)	(2.164)
D_MANDATORY	-	-1.989	-13.959*	-8.600
		(2.344)	(6.779)	(5.726)
D_VOLUNTARY	+	0.064	4.177*	-0.107
		(0.338)	(2.009)	(5.005)
Indirect effect				
D_MANDATORY × TAVD	+	3.240	17.445	13.206**
		(4.660)	(9.434)	(4.424)
D_VOLUNTARY × TAVD	-	2.662	-5.915*	0.389
		(2.472)	(2.864)	(5.966)
Controls (output omitted)				
Firm level		YES	YES	YES
Auditing and monitoring		YES	YES	YES
Governance		NO	NO	NO
Institutional		YES	YES	YES
N		47	90	48
Adjusted R^2		0.166	0.408	0.267
PANEL B:		"Low" (Cluster 1)	"Intermediate" (Cluster 2)	"High" (Cluster 3)
Direct effect				
TAVD	-	24.852	7.255	-10.864**
		(17.733)	(3.971)	(4.191)
D_MANDATORY	-	0.298	7.489	-16.832*
		(0.912)	(4.339)	(7.177)
D_VOLUNTARY	+	-0.077	4.276	-2.170
		(0.220)	(3.222)	(2.074)
Indirect effect				
D_MANDATORY × TAVD	+	-68.757	-13.698	22.518*
		(44.716)	(7.452)	(10.096)
D_VOLUNTARY × TAVD	-	12.463	-6.581	2.625
		(7.403)	(5.064)	(2.657)
Controls (output omitted)				
Firm level		YES	YES	YES
Auditing and monitoring		YES	YES	YES
Governance		NO	NO	NO
Institutional		YES	YES	YES
N		23	48	114
N (% of initial sample)		0.124	0.259	0.616
Adjusted R^2		0.411	0.319	0.314

Notes: $FV_{i,c} = \gamma_0 + \gamma_1 TAVD_i + \gamma_2 DISCL_i + \gamma_3 (DISCL_i \times TAVD_i) + CONTROLS + v_{i,c}$

The dependent variable in all the specifications is: *FV* = Tobin's Q, which is a proxy to assess firms' value. Tax avoidance (*TAVD*) is measured by *LCETR*. The entire sample was split into three parts. In **Panel A** the first column comprises the 25% of firms that pay less taxes, and the third column contains the top 25% tax aggressive firms. Column (2) includes the remaining 50% observations. In **Panel B**, the sample is split using a non-hierarchical clustering method, in which firms are grouped into three groups by the nearest mean. Hierarchical cluster analysis using Wald's method as a cluster method suggests using 3 to 4 clusters. In both Panels, controls for corporate governance are not considered, as these showed no statistical significance in previous estimates, and there is no data for all firms.

Coefficients for controls are not reported. Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 3.9: Additional analyses: quality of corporate governance

		Firm Value (*FV*)			
		Institutional Ownership (*IOWN*)		Insider Ownership (*INSIDER*)	
		"High"	"Low"	"High"	"Low"
	Sign	(1)	(2)	(3)	(4)
Direct effect					
TAVD	-	-2.032	-3.044*	-2.376	-2.687*
		(1.474)	(1.364)	(1.284)	(1.343)
D_MANDATORY	-	-3.066	-3.361**	-2.992	-2.654
		(2.646)	(1.092)	(2.216)	(1.547)
D_VOLUNTARY	+	0.576	0.091	1.082***	-0.287
		(0.501)	(0.253)	(0.298)	(0.186)
Indirect effect					
D_MANDATORY × *TAVD*	+	4.460	6.430*	5.173	5.421*
		(3.832)	(2.975)	(3.292)	(2.824)
D_VOLUNTARY × *TAVD*	-	-0.907	0.024	-1.609***	0.568
		(0.606)	(0.426)	(0.359)	(0.378)
Controls (output omitted)					
Firm level		YES	YES	YES	YES
Auditing and monitoring		YES	YES	YES	YES
Governance		NO	NO	NO	NO
Institutional		YES	YES	YES	YES
N		90	90	90	89
Adjusted R^2		0.239	0.354	0.290	0.336

Notes: $FV_{i,c} = \gamma_0 + \gamma_1 TAVD_i + \gamma_2 DISCL_i + \gamma_3 (DISCL_i \times TAVD_i) + CONTROLS + v_{i,c}$

The dependent variable in all the specifications is: *FV* = Tobin's Q, which is a proxy to assess firms' value. Tax avoidance (*TAVD*) is measured by *LCETR*. To select the subsample used in columns (1) and (2), our sample is split into two parts by the median of institutional ownership (*IOWN*). Higher values of *IOWN* correspond to firms with a higher quality of corporate governance. In columns (3) and (4) the subsamples were defined by the median level of insider ownership (*INSIDER*). There is no available data of *IOWN* for 5 firms, and of *INSIDER* for 6 firms.

Coefficients for controls are not reported. Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 3.10: Additional analyses: disclosure in "other comprehensive income"

		Firm Value (*FV*)			
	Sign	(1)	(2)	(3)	(4)
Direct effect					
TAVD	-	-0.356**	-0.627**	-0.745**	-0.756**
		(0.115)	(0.184)	(0.227)	(0.225)
D_OCI	-	0.211	-0.238	-0.405	-0.429
		(0.124)	(0.216)	(0.235)	(0.266)
Indirect effect					
D_OCI × *TAVD*	+		0.707	0.931*	0.949*
			(0.406)	(0.419)	(0.435)
Controls (output omitted)					
Firm level		YES	YES	YES	YES
Auditing and monitoring		NO	NO	YES	YES
Governance		NO	NO	NO	NO
Institutional		NO	NO	NO	YES
N		185	185	185	185
Adjusted R^2		0.239	0.242	0.311	0.304

Notes: $FV_{i,c} = \gamma_0 + \gamma_1 TAVD_i + \gamma_2 D\_OCI_{\ i} + \gamma_3 (D\_OCI_{\ i} \times TAVD_i) + CONTROLS + v_{i,c}$

The dependent variable in all the specifications is: *FV* = Tobin's Q, which is a proxy to assess firms' value. *D_OCI* comprises the scoring of disclosure related to components of other comprehensive income. While in column (1) only firm level variables are included, in column (2) interaction terms are included. Column (3) adds other firm level controls. Column (4) presents the full specification. Interaction terms capture indirect effects and are related to H3. Independent variables are detailed in Table 3.2. Tax avoidance (*TAVD*) is measured by *LCETR*. Controls for corporate governance are not considered, as they showed no statistical significance in previous estimates, and there is no data for all firms.

Coefficients for controls are not reported. Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 3.11: Effect on firm value: random/fixed effect specification at country level

		Firm Value (*FV*)			
	Sign	(1)	(2)	(3)	(4)
PANEL A:					
Direct effect					
TAVD	-	-0.257**	-2.081*	-2.519***	-2.527***
		(0.092)	(0.954)	(0.790)	(0.824)
D_MANDATORY	-	0.700	-2.147	-3.149***	-3.146***
		(0.741)	(1.190)	(0.918)	(0.911)
D_VOLUNTARY	+	0.076	0.300	0.389*	0.392*
		(0.104)	(0.181)	(0.203)	(0.208)
Indirect effect					
D_MANDATORY × TAVD	+		4.320*	5.217***	5.238***
			(2.118)	(1.789)	(1.875)
D_VOLUNTARY × TAVD	-		-0.329	-0.503	-0.507
			(0.322)	(0.344)	(0.349)
Controls (output omitted)					
Firm level		YES	YES	YES	YES
Auditing and monitoring		NO	NO	YES	YES
Governance		NO	NO	NO	NO
Institutional		NO	NO	NO	YES
Country FE		YES	YES	NO	NO
Country RE		NO	NO	YES	YES
N		185	185	185	185
Adjusted R^2		0.286	0.293	0.339	0.339
PANEL B: Hausman test					
χ^2		59.51	28.33	15.85	20.67
p-value		0.0000	0.0016	0.2574	0.0797

Notes: $FV_{i,c} = \gamma_0 + \gamma_1 TAVD_i + \gamma_2 DISCL_i + \gamma_3 (DISCL_i \times TAVD_i) + CONTROLS + v_{i,c}$

This table distinguishes from estimations in Table 3.7 by using a fixed effects specification at firm level, instead of per country.

Panel A. The dependent variable in all the specifications is: *FV* = Tobin's Q, which is a proxy to assess firms' value. While in column (1) only firm level variables are included, in column (2) interaction terms are included. Column (3) adds other firm level controls. Column (4) presents the full specification. Interaction terms capture indirect effects and are related to robustness of H3. Independent variables are detailed in Table 3.2. Tax avoidance (*TAVD*) is measured by *LCETR*. Controls for corporate governance are not considered, as they showed no statistical significance in previous estimates, and there is no data for all firms. While in columns (1) and (2) the results are presented using a fixed effect specification to control for unobserved variations per country, results in columns (3) and (4) are performed using a random effects specification. In each columns results are very similar, using either random or fixed effects.

In **Panel B** results are reported for the Hausman test. It aims to assess whether fixed or random effects specification are appropriate to control for each firms' omitted variables.

Coefficients for controls are not reported. Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 3.12: Effect on firm value: alternative measures of tax avoidance

	Sign	Firm Value (*FV*) (1)	(2)	(3)	(4)
PANEL A: (*TAVD=LCETR/CITR*)					
Direct effect					
TAVD	-	-0.319**	-1.129**	-1.221**	-1.244**
		(0.096)	(0.402)	(0.441)	(0.450)
D_MANDATORY	-	-0.000	-1.875*	-2.343**	-2.327**
		(0.452)	(0.964)	(0.894)	(0.884)
D_VOLUNTARY	+	0.097	0.325	0.375	0.381
		(0.148)	(0.238)	(0.227)	(0.233)
Indirect effect					
D_MANDATORY × TAVD	+		1.985*	2.130*	2.175*
			(1.033)	(1.086)	(1.109)
D_VOLUNTARY × TAVD	-		-0.249	-0.247	-0.255
			(0.171)	(0.172)	(0.177)
Controls (output omitted)					
Firm level		YES	YES	YES	YES
Auditing and monitoring		NO	NO	YES	YES
Governance		NO	NO	NO	YES
Institutional		NO	NO	NO	YES
N		185	185	185	180
Adjusted R^2		0.539	0.541	0.575	0.570
PANEL B: (*TAVD=BOOK ETR*)					
Direct effect					
TAVD	-	-0.107	-2.285*	-2.936*	-2.980*
		(0.188)	(1.138)	(1.284)	(1.323)
D_MANDATORY	-	0.759	-3.002*	-4.382**	-4.530**
		(0.595)	(1.555)	(1.789)	(1.868)
D_VOLUNTARY	+	-0.030	0.361	0.541	0.558
		(0.145)	(0.446)	(0.487)	(0.492)
Indirect effect					
D_MANDATORY × TAVD	+		4.847*	6.018*	6.070*
			(2.403)	(2.760)	(2.837)
D_VOLUNTARY × TAVD	-		-0.470	-0.576	-0.592
			(0.418)	(0.485)	(0.494)
Controls (output omitted)					
Firm level		YES	YES	YES	YES
Auditing and monitoring		NO	NO	YES	YES
Governance		NO	NO	NO	NO
Institutional		NO	NO	NO	YES
N		185	185	185	180
Adjusted R^2		0.227	0.234	0.302	0.295

Notes: $FV_{i,c} = \gamma_0 + \gamma_1 TAVD_i + \gamma_2 DISCL_i + \gamma_3 (DISCL_i \times TAVD_i) + CONTROLS + v_{i,c}$

The dependent variable in all the specifications is: *FV* = Tobin's Q, which is a proxy to assess firms' value. In **Panel A**, the measure of corporate tax avoidance (*TAVD*) is *LCETR* scaled by one minus the statutory corporate income tax rate (*LCETR/CITR*), while in **Panel B** corporate tax avoidance (*TAVD*) is measured by *BOOK ETR*. While in column (1) only firm level variables are included, in column (2) interaction terms are included. Column (3) adds other firm level controls. Column (4) presents the full specification. Interaction terms capture indirect effects and are related to robustness of *H3*. Independent variables are detailed in Table 3.2. Controls for corporate governance are not considered, as they showed no statistical significance in previous estimates, and there is no data for all firms.

Coefficients for controls are not reported. Robust standard errors clustered at country level are presented in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Appendix C. Scoring of Disclosure of Income Taxes

Table 3.13: Method for constructing disclosure scores on IAS 12 (Income Taxes)

Disclosure Standard[28]	**Computation Scores**(1)
D_EXPENSE	
IAS 12, ¶79 and ¶80a-80h: The major components of tax expense (income) shall be disclosed separately. Components of tax expense (income) may include: (a) current tax expense (income); (b) any adjustments recognized in the period for current tax of prior periods; (c) the amount of deferred tax expense (income) relating to the origination and reversal of temporary differences; (d) the amount of deferred tax expense (income) relating to changes in tax rates or the imposition of new taxes; (e) the amount of the benefit arising from a previously unrecognized tax loss, tax credit or temporary difference of a prior period that is used to reduce current tax expense; (f) the amount of the benefit from a previously unrecognized tax loss, tax credit or temporary difference of a prior period that is used to reduce deferred tax expense; (g) deferred tax expense arising from the write-down, or reversal of a previous write-down, of a deferred tax asset in accordance with paragraph 56; and (h) the amount of tax expense (income) relating to those changes in accounting policies and errors that are included in profit or loss in accordance with IAS 8, because they cannot be accounted for retrospectively.	**Major components of tax expense (income)** Per each point, *D_EXPENSE* = 0, if there is no disclosure; 0.5 if there is a quantitative disclosure; +0.25 if there is a qualitative disclosure or explanation; +0.25 if there is comparability to prior periods. *D_EXPENSE* range: 0-8
D_OTHER	
IAS 12, ¶81a-81ae: The following shall also be disclosed separately: (a) the aggregate current and deferred tax relating to items that are charged or credited directly to equity (see paragraph 62A); (ae) the amount of income tax relating to each component of other comprehensive income (see paragraph 62 and IAS 1 (as revised in 2007)); (d) an explanation of changes in the applicable tax rate(s) compared to the previous accounting period;	**Adjustments in equity and other comprehensive income** Per each point, *D_EQT* = 0, if there is no disclosure; 0.5 if there is a quantitative disclosure; +0.25 if there is a qualitative disclosure or explanation; +0.25 if there is comparability to prior periods. *D_EQT* range: 0-2
IAS 12, ¶81c-81d: (c) an explanation of the relationship between tax expense (income) and accounting profit in either or both of the following forms: (i) a numerical reconciliation between tax expense (income) and the product of accounting profit multiplied by the applicable tax rate(s), disclosing also the basis on which the applicable tax rate(s) is (are) computed; (ii) a numerical reconciliation between the average effective tax rate and the applicable tax rate, disclosing also the basis on which the applicable tax rate is computed;	**Effective tax rate** In point (c), *D_RATE* = 0, if there is no disclosure; 0.5 if there is a numerical reconciliation; +0.25 if there is an explanation of the basis on which the applicable tax rate is computed; +0.25 if there is comparability to prior periods. It is considered the compliance with (c)(i) or (c)(ii). In point (d), *D_RATE* = 0, if there is no disclosure; 0.75 if there is an explanation; +0.25 if there is comparability to prior periods. *D_RATE* range: 0-2

[28] Disclosure requirements of IAS 12 as in the EC staff consolidated version of 21 June 2012.

IAS 12, ¶81e-81f: (e) the amount (and expiry date, if any) of deductible temporary differences, unused tax losses, and unused tax credits for which no deferred tax asset is recognized in the statement of financial position; (f) the aggregate amount of temporary differences associated with investments in deferred tax liabilities have not been recognized (see paragraph 39);	**Unrecognized temporary differences** Per each point, *D_NRDIFF* = 0, if there is no disclosure; 0.5 if there is a quantitative disclosure; +0.25 if there is a qualitative disclosure or explanation; +0.25 if there is comparability to prior periods. *D_NRDIFF* range: 0-2
IAS 12, ¶81g: (g) in respect of each type of temporary difference, and in respect of each type of unused tax losses and unused tax credits: (i) the amount of the deferred tax assets and liabilities recognized in the statement of financial position for each period presented; (ii) the amount of the deferred tax income or expense recognized in profit or loss, if this is not apparent from the changes in the amounts recognized in the statement of financial position;	**Recognized temporary differences** Per each point, *D_RDIFF* = 0, if there is no disclosure; 0.5 if there is a quantitative disclosure; +0.25 if there is a qualitative disclosure or explanation; +0.25 if there is comparability to prior periods.[(2)] *D_RDIFF* range: 0-2
IAS 12, ¶81h: (h) in respect of discontinued operations, the tax expense relating to: (i) the gain or loss on discontinuance; and (ii) the profit or loss from the ordinary activities of the discontinued operation for the period, together with the corresponding amounts for each prior period presented	**Discontinued operations** *D_DISC* = 0, if no information is disclosed, 0.25 if just (i) is disclosed; 0.50 if (i) and (ii) are disclosed, except for the corresponding amounts for each prior period presented; +0.25 it the corresponding amounts for each prior period presented are disclosed. *D_DISC* range: 0-1
IAS 12, ¶81i: (i) the amount of income tax consequences of dividends to shareholders of the entity that were proposed or declared before the financial statements were authorized for issue, but are not recognized as a liability in the financial statements;	**Interim dividends** *D_DIVID* = 0, if there is no disclosure; 0.5 if there is a quantitative disclosure; +0.25 if there is a qualitative disclosure or explanation; +0.25 if there is comparability to prior periods.[(3)] *D_DIVID* range: 0-1
IAS 12, ¶81j-81k: (j) if a business combination in which the entity is the acquirer causes a change in the amount recognized for its pre-acquisition deferred tax asset (see paragraph 67), the amount of that change; and (k) if the deferred tax benefits acquired in a business combination are not recognized at the acquisition date but are recognized after the acquisition date (see paragraph 68), a description of the event or change in circumstances that caused the deferred tax benefits to be recognized.	**Business combinations** *D_BCOMB* = 0, if there is no disclosure; 0.5 if there is a quantitative disclosure; +0.25 if there is a qualitative disclosure or explanation; +0.25 if there is comparability to prior periods. It is considered the compliance with (j) or (k). *D_BCOMB* range: 0-1

Notes:

[(1)] *D_OTHER* comprises the sum of *D_EQT*, *D_RATE*, *D_NRDIFF*, *D_RDIFF*, *D_DISC*, *D_DIVID* and *D_BCOMB*. The overall index of disclosure of income taxes (*D_MANDATORY*) ranges from 0 to 19. *D_MANDATORY* is equal to *D_EXPENSE* plus *D_OTHER*, and it is further rescaled to range between 0 and 1.

[(2)] In ¶'81g(ii)', the score is 0, if the deferred tax income or expense is neither apparent in the statement of financial position, nor detailed in the notes to the financial statements.

[(3)] It includes the recommendations in ¶82A and ¶87A.

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4. Crossing the Border: Regional Tax Differences and Firm Creation

Abstract

Does the introduction of reduced corporate income tax rates at regional level increases firm creation? Instead of focussing on existing corporate income tax rate differentials, we take advantage of a quasi-natural experiment to study the introduction of reduced corporate income tax rates at regional level. Results suggest that the creation of firms increased with the introduction of reduced corporate income tax rates for specific regions. However, further variations in the corporate income tax rate differential between regions appear to be ineffective in fostering the creation of firms. Indeed, the effect on firm creation is robust regarding border competition, whereby neighbouring municipalities compete for corporate income tax rates. Job creation appears to be positively affected, these new firms are typically small, and the likelihood of their survival appears to be enhanced by the tax change. The findings also highlight the influence of agglomerations in order to take advantage of the tax change. Taken altogether, the findings contrast with the previous literature, which is focussed on existing tax rate differentials, as we demonstrate that what really triggers the creation of new firms is when a tax rate differential between regions is created.

JEL classification: H25; L26; M13

Keywords: Business Taxation; Entrepreneurship; Firm Entry

4.1. Introduction

Beyond the discussion of whether governments should implement tax incentives to promote regional development, a central question remains: which tax incentives foster development? Taking advantage of a quasi-natural experiment, the aim of this paper is to understand whether, and to what extent, introducing reduced corporate income tax rates for specific regions triggers firm creation in those regions.

Governments are increasingly concerned about asymmetries across regions, which means that within a country several regions exhibit different levels of economic development. One way of dealing with such asymmetries is through tax incentives. Regional tax incentives are justified by the potential significant effect of new businesses on the economic development of target regions (Fritsch, 2008). However, it remains controversial as to whether tax incentives for corporate taxes have a positive effect on regional economic growth (Hansen & Kalambokidis, 2010) and, in turn, on entrepreneurial activity. This controversy may exist because tax policies regarding corporate taxation for the promotion of entrepreneurship have received little attention by researchers (Da Rin, Di Giacomo, & Sembenelli, 2011).

There are several types of tax incentives (Klemm, 2010), although the focus in this paper is on reduced corporate income tax rates. Several existing empirical studies have analysed whether lower corporate income tax rates and existing tax rate differentials between countries and regions foster the creation of firms (e.g., Gentry and Hubbard (2005); de Mooij and Nicodème (2008); Egger, Keuschnigg, and Winner (2009); Djankov, Ganser, McLiesh, Ramalho, and Shleifer (2010); Da Rin et al. (2011); Bacher and Brülhart (2012); Bruce and Deskins (2012)). In particular, the studies of Djankov et al. (2010) and Da Rin et al. (2011) extended the literature about the effect of corporate

taxes on the level of entrepreneurial activity across countries. However, these studies are cross-country comparisons, focussing on existing corporate income tax rate differentials, rather than on the creation of the differential.

Our study is motivated by the entry in force in 2001 of the Portuguese tax incentives for firms located in the Interior (what the Portuguese tax administration call 'tax incentives to inlandness'), which affected about 170 of the 278 Portuguese municipalities on the mainland. These tax incentives aimed to promote entrepreneurial activity in order to trigger the economic recovery of Portuguese less-favoured municipalities. Up until 2001, firms located in all the Portuguese municipalities on the mainland were subject to the same statutory corporate income tax rates. Under these tax incentives, new and established firms located in specific municipalities qualify for reduced corporate income tax rates from 2001 onwards.[29]

We use a unique matched employer-employee dataset (*Quadros de Pessoal*) which contains comprehensive information about approximately 345,000 firms per year, covering virtually all the private firms in Portugal. The features of the dataset make it possible to compare firms which are affected by the normal statutory corporate income tax rate (in non-eligible municipalities) with those that are located in the municipalities eligible for the tax change.

Our results suggest that introducing reduced corporate income tax rates exerts a significantly positive effect on the creation of firms, and job creation is also positively affected. Further variations in the corporate income tax rate differential between regions were also analysed, although results are unclear. They suggest that once the tax rate differential is established, the dimension of the differential is not critical in influencing

[29] As a result of the measures taken under the austerity programme, the tax incentives were later abolished in 2011.

entrepreneurial activity. This finding is contradictory to most of the existing literature (e.g., Gentry and Hubbard (2005); Egger et al. (2009); Djankov et al. (2010); Da Rin et al. (2011); Bacher and Brülhart (2012)), although it is consistent with the findings of de Mooij and Nicodème (2008).[30] This divergence from many earlier studies might be due to the fact that these studies focus on existing tax rate differentials between regions or countries, and they neglect the period where these differentials were firstly created. Our results highlight that introducing tax incentives, such as reduced corporate income tax rates, significantly affects the creation of new firms in the years immediately following the reduction, whilst further reductions are not effective for fostering firm creation.

With the tax change, some municipalities located in the inland region that benefitted from these tax incentives competed directly with their neighbouring municipalities from the coastal region, when the tax factor is exclusively considered. The results support the view that entrepreneurs cross the border to those neighbouring municipalities where firms are subject to reduced corporate income tax rates, which is coherent with existing evidence (e.g., Rathelot and Sillard (2008)). Furthermore, firm entry from this type of tax incentives appears to be more likely amongst firms with 3 to 5 employees, which is partially in contrast to de Mooij and Nicodème (2008), and also new firms are concentrated in industries such as wholesale trade, retail trade, construction, manufacturing, and services. Moreover, we find that implementing this fiscal policy – introduction of reduced corporate income tax rates for specific regions – exerts a positive effect on the survival likelihood of new firms that are established in municipalities that benefit from this policy.

[30] Throughout this paper we refer to the working paper version of de Mooij and Nicodème (2008), as the analysis of entrepreneurial activity is hidden from the published article in the *International Tax and Public Finance*. The published version only focuses on income shifting from the personal to the corporate tax base.

This study contributes to extending the current literature on taxes and entrepreneurship which has not come to a broad consensus. This study highlights that introducing reduced corporate income tax rates for specific regions fosters the creation of firms. The view of the literature on tax competition is validated, as there is support for the view that entrepreneurs cross the border in order to be located on the lower taxed area – the neighbouring municipality. Moreover, there is some support for the influence of agglomeration economies on the location of new firms (Devereux, Griffith, & Simpson, 2007), whilst these new firms are typically small in size, and characterized by low levels of technological intensity. Our contribution benefits from using a specific fiscal policy as a proxy for assessing the effect of introducing reduced corporate income tax rates on the creation of firms, which is combined with a unique dataset, a quasi-natural experiment approach, and focusses on the type of new firms, job creation and firms' survival likelihood. A controversy in the literature concerns the small size and weak innovative ability of such new firms (Shane, 2009). Our findings support these arguments to a degree.

The remainder of the paper is organised as follows. Section 4.2 presents the literature review and the research hypotheses. In Section 4.3, the Portuguese tax incentives to inlandness are briefly described. Section 4.4 presents the data and describes the empirical methodology; Section 4.5 discusses the empirical findings and performs robustness checks, and the last section summarises and concludes the paper.

4.2. Literature Review

The literature on taxation and entrepreneurship has developed rapidly over the last few years, driven by the growing importance of entrepreneurial activity on economic

activity. Previous research on this topic consists primarily of studies at a country level, such as cross-country comparisons. Nonetheless, due to the growing availability of micro-level data some studies at regional level have emerged. Differences in effective tax rates amongst countries might affect the organisation of business activity, the industry mix of productive activity, and therefore the incentives for entrepreneurship (Hanlon & Heitzman, 2010). Nevertheless, there is no consensus about the role of corporate taxes on economic development, and in the literature different studies are found which support both a positive effect, or an opposite effect (Fritsch, 2008). To set up our framework, we focus in two streams of literature of taxation: (i) individuals' risk-taking towards entrepreneurship, and; (ii) location decisions. The first framework emphasises the decision to incorporate in the face of a specific tax setting in a jurisdiction, whilst the second stream of literature studies the determinants of firm location across jurisdictions.

4.2.1. Corporate Taxes and Firm Creation

Similar to Da Rin et al. (2011), we follow the theoretical model of Cullen and Gordon (2007) about how individuals' risk-taking relates to taxation. The decision to incorporate might be affected by various issues. The theoretical model of Cullen and Gordon (2007) focusses on three issues. The first is the trade-off between progressivity of personal income tax rates and traditional flat tax rates on corporate income. Individuals should consider whether to be taxed either at a personal level, or as a legal corporate entity. As marginal tax rates on personal income increase with taxable income, above a certain threshold individuals have more incentive to incorporate and to be taxed under corporate income tax rates.

From the model of Cullen and Gordon (2007), individuals' choice of organisational form encourages risk-taking with the increase in the gap between income tax payable derived from progressive personal income tax rates and income tax payable by a legal corporate entity. Risk-taking arises as individuals taxed at corporate level will require lower pre-tax rates of return on high income projects, when compared with individuals taxed at a personal level. Da Rin et al. (2011) refers to this as being "risk subsidy". That is to say, it "depends on the progressivity/regressivity of the effective tax schedule on business income over the entire range of possible outcomes" (Cullen & Gordon, 2007). Risk-taking is discouraged in progressive tax systems, while neutrality is found when taxes are proportional.

The second issue raised by Cullen and Gordon (2007) is interconnected with the previous one. Besides the trade-off between progressivity of personal tax rates versus traditional flat tax rate on corporate income, tax rates at a corporate level are often lower than tax rates on personal income. These features encourage individuals to create their own job. By nature, being self-employed is riskier than working as an employee of a legal corporate entity, and taxpayers may well lower their tax burden with incorporation when expected income is considerably high. This phenomenon is characterised by "income-shifting" from personal taxation to corporate taxation.

Regarding self-employment, the literature suggests that no single common factor affects self-employment trends; however tax environment plays an important role (Schuetze, 2000). de Mooij and Nicodème (2008) found that between 12 to 21 percent of corporate tax revenues in Europe might come from income-shifting from a personal to a corporate tax base, as a result of the trend of lower corporate income tax rates.[31]

[31] Estimates are between 10 and 17 percent in the unpublished version of 2007.

Apart from this discussion, Bruce and Mohsin (2006) argue that a large tax rate change would be required to have a significant influence on self-employment. Furthermore, Bruce and Deskins (2012) focus on the dichotomy between personal and corporate taxes. They did not find a statistically significant effect for top corporate income tax rate at State level for State entrepreneurship rates. In a different perspective, Bacher and Brülhart (2012) focus on a tax reform that implemented a flat tax model for corporations in Switzerland. They find a deterrent effect for high average tax rates and tax codes complexity on the creation of firms, whilst progressivity exerted an opposite effect. These different findings in the literature at country level are mostly the outcome of different approaches and data availability, although de Mooij and Nicodème (2008) propose that firms are not equally affected by corporate taxes – it depends on firms size. As size increases, the rate of creation of firms decreases.

A third mechanism is highlighted by Cullen and Gordon (2007), whereby tax systems affect individuals' decisions to undertake risky projects in "risk sharing" with the government, as "the higher are the marginal tax rates on business income, the less risk the entrepreneur bears net of tax, and so the easier it is to undertake a riskier project". Empirically, the effect that corporate taxes exert on firm entry has not reached a broad consensus. Using macro-level data for 85 countries, Djankov et al. (2010) conclude that a 10 percentage point increase in effective corporate income tax rate reduces entry by 1.4 percent. Similar conclusions are addressed by Gentry and Hubbard (2005), Egger et al. (2009), and Da Rin et al. (2011), who performed macro analyses.

Da Rin et al. (2011) analyse whether corporate taxation affects firm entry decisions through a panel data of 17 European countries. Overall, they find a significant negative effect of corporate taxation on entry rates. On the other hand, de Mooij and Nicodème

(2008), using the macro-level data of 20 European countries, find an ambiguous impact of lower corporate income tax rates on entrepreneurship. Nonetheless, these two studies are not directly comparable, due to their different approaches. Da Rin et al. (2011) focus on effective corporate income tax rates amongst countries over nearly a decade, whilst de Mooij and Nicodème (2008) focus on income shifting from the personal to the corporate tax base.

Egger et al. (2009) proposed a theoretical model and tested its predictions using data from about 540,000 manufacturing firms, from 26 European economies. Their model highlights the effect of limited liability and access to external capital as being drivers for incorporation. They find that firms' probability to incorporate is reduced by higher effective corporate income tax rate, whilst higher personal income tax rates exert an opposite influence on incorporation. Results hold when controlling for other determinants of incorporation.

The research of Hansson (2012) focusses on the decision to become self-employed in Sweden, as a consequence of changes in corporate income tax rates using data on Swedish tax returns from about 75,000 individuals per year, over a 16-year time span. They find that both average or marginal tax rates exert a negative effect on the decision to become self-employed. Gentry and Hubbard (2005) used data from 1979 to 1992 to study whether fiscal policy (dis)encourages entry in the US. Results suggest a negative effect of marginal tax rates on entrepreneurial activity. The same conclusion was reached regarding the progressivity of tax rates.

4.2.2. Corporate Taxes and Firm Location Decisions

Taxation might exert a vital influence in firms' location decision amongst countries (e.g., Devereux and Griffith (1998); Hubert and Pain (2002); Devereux and Griffith (2003); Barrios, Huizinga, Laeven, and Nicodème (2009); Hebous, Ruf, and Weichenrieder (2011)). This influence of taxation on firms' location decision also arises at regional level. For instance, Jofre-Monseny and Sole-Olle (2010) suggest that "local taxes on business and property deter new manufacturing establishments" in Spain. For Bacher and Brülhart (2012), high average tax rates depress the rates of the creation of firms in Switzerland. Furthermore, with respect to Switzerland, Feld and Kirchgassner (2003) argue that corporate income taxes deter firms from locating in a specific canton, resulting in the reduction of local employment. In Germany, firms appear to shift wages to permanent establishments that are located in municipalities that levy lower trade tax rates (Thomsen, Ullmann, & Watrin, 2014).

What are the determinants of firms' location? In the literature, numerous factors might affect the location newly-created firms. Mota and Brandão (2013) cluster these location determinants as: supply variables, demand variables, and agglomeration economies. Nevertheless, firm level variables and some characteristics that are endogenous to the entrepreneur also shape firms' location decisions. Region of origin and age are some examples. Entrepreneurs tend to locate new firms near to their region of origin (e.g., Stam (2007), Figueiredo, Guimaraes, and Woodward (2002); Dahl and Sorenson (2012)). The proximity to the region of origin of entrepreneurs is more pronounced in firms' early growth and accumulation stages (Stam, 2007), and it increases the likelihood of survival and generates greater cumulative returns (Dahl & Sorenson, 2012). Nevertheless, agglomeration economies might offset the preference

for ‘home-location’ choices (Figueiredo et al., 2002). On the other hand, empirical evidence strongly suggests an inverted U-shaped relationship between age and start-up activity at regional level (Bönte, Falck, & Heblich, 2009).

Typical supply variables studied in the literature concern cost of production factors, such as land and labour costs. The research of Guimarães, Figueiredo, and Woodward (2004) is amongst the very few studies that confirm the negative impact of land costs on the probability of location in a given place. Nevertheless, the influence of both labour and land costs might be offset by demand variables and agglomeration effects (Deichmann, Lall, Redding, & Venables, 2008).

In terms of demand factors, the literature typically highlights market size (e.g., Janeba and Osterloh (2013)), regional industrial structure (e.g., Devereux et al. (2007)), institutional environment (e.g., Disdier and Mayer (2004); Martin, Salomon, and Wu (2010)), and market accessibility (e.g., Holl (2004a)). Market accessibility is the distance to main economic agglomerates. For instance, Holl (2004b) find that improvements in the Portuguese motorway network yielded a mixed effect on the creation of firms. It was important to trigger new firms in many sectors, especially those with high transportation costs, although they find little evidence about the benefits from such agglomeration.

The agglomeration effect is studied in the literature by both theoretical and empirical studies. A new strand of literature is related to the theory of “New Economic Geography”. To represent agglomeration economies, the literature distinguishes between urbanisation economies and localisation economies. The latter relates to clusters of firms in the same industry that aggregate specialised employees and basic services to the development of the industry, amongst others. On the other hand,

urbanisation economies refers to the general clustering of economic activities. The empirical evidence suggests that the creation of firms is more likely to be situated in localisation and urbanisation economies (e.g., Guimarães, Figueiredo, and Woodward (2000)), and this effect may be more significant in the industrial sector and amongst export firms (e.g., Rocha (2008)). The agglomeration effect is heterogeneous across regions and industries. For instance, Carod and Antolin (2004) focussed in Catalonia, and find that labour-intensive firms tend to be located in the major economic agglomerate (Barcelona), whilst capital-intensive firms tend to be located outside the major economic agglomerate.

In theory, decreases in tax rate attracts new firms. This is the rational under the tax competition literature. Nevertheless, the theory of "New Economic Geography" argues that agglomerated regions can tax more, as firms aim to benefit from agglomeration economies and from local public goods (Baldwin & Krugman, 2004). Charlot and Paty (2007) refer to this as "taxable agglomeration rent". They found the existence of taxable agglomeration rent in French localities. Empirical studies also found the presence of taxable agglomeration rents in Belgian districts (Crabbe & De Bruyne, 2013); and in Swiss (Coulibaly, 2008; Luthi & Schmidheiny, 2014) and German (Koh, Riedel, & Bohm, 2013) municipalities.

One region which is widely studied in the literature of location decisions is Catalonia – Spain. For, instance Jofre-Monseny (2013) finds for municipalities with higher urbanisation economies and municipalities that host a cluster in an industry in which location economies is important, both set higher tax rates on businesses. In addition to national corporate taxes, in most countries several regions are allowed to apply a tax rate which typically is levied on a taxable income or income tax payable basis. These

regions compete with their neighbouring regions to attract businesses, exclusively considering tax motives. Accordingly, Rathelot and Sillard (2008) focus on the French case, as all 36,707 French municipalities are allowed to choose a specific tax rate which operates directly on a taxable income basis. They found that when the tax differential between two neighbouring municipalities increases by one percentage point, then the probability of firms setting up on the lower taxed side increases by one percentage point. Nonetheless, this firm sensitivity to existing tax differentials may differ in jurisdictions dissimilar in size to their neighbours (Jofre-Monseny & Sole-Olle, 2012), and in more spatially concentrated industries (Brulhart, Jametti, & Schmidheiny, 2012).

These industries are not clearly identified in the literature, and little is known about other characteristics, such as size and technology. Nevertheless, some of the literature suggests that politicians should be worried about the excess (Santarelli & Vivarelli, 2007) and quality (Shane, 2009) of entry. Some worries are related to the marginal contribution of new firms to regional development, and others originate from the high rates of failures amongst entrepreneurial activity. Shane (2009) claim that "Policy makers believe a dangerous myth. They think that start-up companies are a magic bullet that will transform depressed economic regions, generate innovation, create jobs, and conduct all sorts of other economic wizardry".

Previous research on the Portuguese case during the 1980's concluded that 20 per cent of new firms closed during their first year, and that only 50 percent of new firms survived for at least 4 years (Mata & Portugal, 1994). A recent study on Georgia suggests that firms located in urban areas are at a higher risk of failure, and that the chance of surviving is better for firms located in regions that had achieved a high level of economic development (Christie & Sjoquist, 2012). In OECD countries, about 20 to

40 per cent of new firms appear to fail within the first two years of life (Bartelsman, Scarpetta, & Schivardi, 2005). Even so, studies about corporate taxes and firm creation tend not to consider firms' survival likelihood.

In addition to tax rates, subsidies and benefits are widely used by local governments to attract new firms. Devereux et al. (2007) focus on UK discretionary government grants (subsidies), and limits their analysis to firms which are multinationals, or larger multi-plant ones. They find that subsidies exert a small and positive impact on attracting new firms, and point out the relevance of agglomerations for firms' response to tax breaks. In order to reach this conclusion, they introduced an important assumption – firms in more agglomerated industries tend to locate new plants close to other plants within the same industry. Despite all the determinants listed in the literature, it is important to highlight that new firms might not be sensitive to the same location characteristics of a business relocation. They have different preferences, according to their life cycle. New firms are more sensitive to local market size, qualified labour forces, labour costs, and a more diversified environment, whereas business relocation is more likely to be due to market accessibility, greater industry basis, and the availability of producer services (Holl, 2004a).

4.2.3. Research Hypotheses

The focus of this study is to understand whether introducing reduced corporate income tax rates at regional level affects entrepreneurial activity and employment. As noted above, the findings in the literature yield mixed results, although there is more support for a negative relation between corporate income tax rates and firm entry (e.g., Gentry and Hubbard (2005); Egger et al. (2009); Djankov et al. (2010); Da Rin et al.

(2011); Bacher and Brülhart (2012); Bruce and Deskins (2012)). Previous studies do not focus on when the tax rate differential between regions is created, and thus this remains a gap in knowledge which requires further attention. Therefore, our first research hypothesis is as follows:

H1: The introduction of reduced corporate income tax rates at regional level exerts a positive effect on the creation of new firms.

Another issue that earlier studies have touched on is whether the creation of firms depends upon the proximity of the regions that compete for corporate income tax rates. The existence of tax rate differentials creates competition between regions where the lower taxed region appears to have a significant competitive advantage (Rathelot & Sillard, 2008). The Portuguese tax incentives to inlandness influenced regional competition on corporate income tax rates, as some municipalities were able to compete on corporate income tax rates with their neighbouring municipalities. Therefore, we hypothesise the following:

H2: The effect of the introduction of reduced corporate income tax rates at regional level on the creation of new firms is higher among municipalities that compete directly with their neighbours on corporate income tax rates.

Corporate taxes may influence employment, due to their effect on investment and production (Cottarelli, 2012). Individual risk-taking might shape the decision to incorporate and consequently generate more employment. Nevertheless, at regional level, the influence of corporate income tax rates on employment is somewhat ambiguous in the literature. For instance, in Switzerland, tax rate differences between

cantons does not appear to exert influence on employment (Feld & Kirchgassner, 2003). Thus, we present the following hypothesis:

H3: The introduction of reduced corporate income tax rates at regional level exerts a positive effect on job creation.

Several important studies exist which focus on entrepreneurial activity, although little is still known about the type of new firms that are affected by fiscal policies. Additionally, this study aims to understand which type of firms benefit from the introduction of reduced corporate income tax rates. The focus is on firms' size, industry sector, and on the level of technological intensity. Moreover, previous studies claim that new firms are amongst those least likely to survive (e.g., Mata and Portugal (1994) and Bartelsman et al. (2005)), although this depends on the development of the regions where they are established (Christie & Sjoquist, 2012). The fourth research hypothesis is as follows:

H4: Firms' survival likelihood does not improve for new firms that are located in regions that are eligible for the introduction of reduced corporate income tax rates.

4.3. The "Portuguese tax incentives to inlandness"

Before 2001, both new and established firms in all the Portuguese municipalities on the mainland levied the same statutory corporate income tax rate.[32] However, in 2001 tax incentives were introduced for the inland regions, splitting the country into two parts – the coastal part and the inland part, as illustrated in the left-hand side of the map in Figure 4.1. These tax incentives benefitted 170 of the 278 municipalities on the mainland. The most important measure of these tax incentives was the introduction of

[32] A detailed explanation of the tax incentives to inlandness is described in Appendix E.

reduced corporate income tax rates for both established firms, and also new firms that were located in eligible municipalities.

As is shown in Table 4.1 a corporate income tax rate differential between the two Portuguese regions was introduced in 2001. In 2005 the first revision of these tax incentives took place, which resulted in corporate income tax rates being reduced even further. In 2008 a further reduction took place, in which corporate income tax rates were lowered even more, and at the same time, the average differential between regions was increased.

The main conditions for firms to qualify for these tax incentives was that they had to locate their headquarters or effective management in an eligible municipality, and had to establish more than 75 percent of their staff there. Furthermore, they had to be part of an industry other than agriculture, fishing, coal mining and transportation. A special taxation regime for sole proprietorship was also introduced in 2001. In fact, most businessmen and professionals may have decided not to incorporate, on account of the implementation of a taxation regime for sole proprietorship. This regime acts as a deterrent for the creation of firms in the setting estimated in this study. In our sample, these unincorporated businesses are not included, and thus the estimated effect on the introduction of reduced corporate income tax rates is somewhat conservative.

4.4. Data and Research Design

4.4.1. Sample Selection

The matched employer-employee dataset used in our analyses is obtained from a survey (*Quadros de Pessoal*) which is sent annually by the Portuguese Ministry of

Solidarity, Employment and Social Security to firms that employ at least one employee. The dataset collects information from about 345,000 Portuguese firms every year, with about 8,200,000 firm-level observations from 1986 to 2009. Hence, it covers virtually all firms in the Portuguese private sector. For each firm, information is available about the year and month of creation, the year of closing down, location (district, municipality and parish level), number of employees, industry sector (with a 2, 4 and 6 industry digit code), number of establishments, sales, initial capital and ownership structure (domestic, foreign and government ownership by share). Data at municipality level used in this study were obtained from the Portuguese National Statistical Institute and the Portuguese National Election Commission.

This study, however, only covers data from 1995 onwards, due to the lack of municipality level statistics from previous years. Thus, from 1995 through to 2009 the original dataset on new firms consists of 441,755 observations, of which about 29 per cent are related to municipalities which have benefitted from the Portuguese tax incentives to inlandness. The two Portuguese Autonomous Regions have mechanisms for implementing specific tax policies. Therefore, 16,835 firm observations from these regions were excluded. Due to the European Commission's decision about tax incentives to inlandness, 35,828 observations related to agriculture, fishing, coal mining, and transportation industries were excluded.[33] The municipalities of Odivelas, Trofa and Vizela were only founded in 1998, and 7,069 observations were therefore excluded which were from these three municipalities. 8,554 observations were also excluded due to missing information regarding the month of entry. A special taxation regime for sole proprietorship was also introduced in 2001, therefore 113,193

[33] Ministerial Order No. 170/2002, of the 28th of February (Portaria). These three industries were not allowed to benefit from the reduced corporate taxes, although only the transportation industry could benefit from the other measures under the tax incentives.

observations regarding these unincorporated entities were therefore excluded. The final sample contains 260,276 firm-level observations about new firms. This sample of firm-level observations was pooled into a monthly level, which resulted in 49,500 observations related to the number of new firms in each municipality per month.

4.4.2. Research Design

The Portuguese tax incentives to inlandness benefitted both new and established firms that were located in eligible municipalities. The dependent variable used here comprises the number of new firms per 100,000 inhabitants, per month, in each municipality (E_{cmt}). This variable is widely used in studies about entrepreneurship and is similar, for instance, to the average entry rate used in the important study of Djankov et al. (2010). A difference-in-differences (DiD) approach is performed with a double quadratic time trend and a fixed effects specification for municipality and month of entry, which compares the treatment and control groups before, and after the entry in force of the tax incentives. Some of the few studies about taxes and entrepreneurship that use this approach are the studies of Fossen and Steiner (2009), which is related to self-employment, and that of Harju and Kosonen (2013) about firms' turnover.

To proxy for job creation, we used a variable in the month of entry which measures the number of employees per new firm at the end of the fiscal year, per municipality. The literature on employment and entrepreneurship is particularly interested in the study of self-employment, although we focus on employment in a broad sense. Following Feld and Kirchgassner (2003), we expect that a tax rate change exerts a positive effect on firm creation, which in turn enhances job creation.

The Portuguese tax incentives to inlandness are used here as proxy for the introduction of reduced corporate income tax rates, considering the entire sample of new firms and subsets of samples containing different sizes, industries, levels of technological intensity, and location of these new firms. The treatment effect is captured by the variable $INLAND_{ct}$, which equals one if the firm is located in an eligible municipality for the tax incentives from 2001 through to 2009, and zero otherwise. A positive coefficient means that introducing reduced corporate income tax rates contributes positively to the dependent variable. We let E_{cmt} be a variable containing the number of new firms per 100,000 inhabitants per month m, municipality c, and year t. We thus estimate:

$$E_{mct} = \beta_1 INLAND_{ct} + \alpha_0 + \beta_2 P.POWER_{ct} + \beta_3 DENSITY_{ct} + \beta_4 URBANIZ_{ct} + \beta_5 LOCALIZ_{ct} + \beta_6 X_t + \beta_7 W_{ct} + \sum_{c=1}^{275} Y_c + \sum_{m=1}^{12} \delta_m + \varepsilon_{mct} \quad (1)$$

where $P.POWER_{ct}$ accounts for per capita purchasing power per municipality and year, and $DENSITY_{ct}$ represents population density per municipality and year. Population density is an indirect proxy for measuring the size of the markets with regard to the theory of agglomeration economies. Furthermore, $LOCALIZ_{ct}$ is included as a proxy to measure localisation economies which is similar to that of Guimarães et al. (2000). $URBANIZ_{ct}$ measures urbanisation economies, as in the research of Mota and Brandão (2013). Detailed description of control variables are set out in Table 4.2. X_t contains a quadratic time trend for the entire sample, and W_{ct} is the quadratic time trend specific for the treatment group. These time trends aim to absorb economic activity trends, as country-level proxies for economic activity exhibits significant multicollinearity with per capita purchasing power. Y_c is the fixed-effects specification for controlling for

municipality-specific characteristics. δ_m accounts for month of entry, as the data shows seasonality in entry. Standard errors are robust and are clustered at municipality level. To study job creation, the dependent variable in equation (1) is replaced by $JOBS_{mct}$, which measures employment in new firms at municipality level c, per month m, and year t. This variable is similar to the measure of employed people used in the study of Feld and Kirchgassner (2003).

Cross-country studies are predominant in the literature of entrepreneurship and corporate taxation, attempting to capture the effect of existing corporate income tax rate differentials on entrepreneurial activity. Even panel data studies that focus on existing corporate income tax rate differentials neglect the creation of these differentials. Instead, they focus on subsequent variations in the dimension of the tax rate differential among countries or regions. To be comparable with previous empirical evidence, we account for variations in the corporate income tax rate differential between regions, after the creation of the differential. The tax incentives were introduced in 2001, but then were subject to two further revisions. Therefore, in a further analysis, we test whether these two revisions exerted a greater positive effect on firm entry. Starting from equation (1), we estimate the following:

$$E_{mct} = \beta_1 INLAND_{ct} + \beta_2 INLAND_{ct} \times T2_t + \beta_3 INLAND_{ct} \times T3_t + \alpha_0 + CONTROLS_{ct} + \varepsilon_{mct} \quad (2)$$

where variables $T2_t$ and $T3_t$ are dummy variables, equalling one for the periods from 2005 to 2007 and from 2008 to 2009, respectively; and zero otherwise. The same controls as those used in equation (1) are used. While equation (1) allows for testing whether the introduction of reduced corporate income tax rates affects the outcome,

equation (2) helps to understand the effect from changes in existent tax rate differentials.

In previous settings, the question as to whether introducing reduced corporate income tax rates triggers firm formation and job creation is tested. A related question is "what happens to the chance of survival of these new firms"? We use a Cox proportional hazard model, which was originally introduced by Cox (1972), which is one of the most popular approaches for the study of survival likelihoods. The survival analysis is performed between 2001 and 2008, comprising all firms that were created and have closed down during this period.[34] We let t represent survival time in years. We then estimate the following:

$$h(t) = h_0(t)exp(b_0 + b_1 INLAND_{ct} + b_2 CONTROLS_{ct}) \quad (3)$$

where similar controls in previews analyses are used here. A hazard ratio higher than one means that the survival likelihood is negatively affected by the treatment effect.

A critical point in our estimations is whether the variable $INLAND_{ct}$ is exogenous. In fact, the selection of eligible municipalities took into account a set of five objective criteria. Even so, our variable of interest might be endogenous, if, in reality, such a selection accounted for political influences. The tax incentives were introduced following a political initiative in 1998 from the most important opposition political party in the Parliament. As shown in Appendix F, this party appears to have played an important role in defining beneficiary municipalities. Thus, to control for potential endogeneity, the model (1) is performed through a two-stage least square (2SLS) approach. As an instrumental variable (IV), a dummy variable is used which takes the value one from 2001 onwards if the municipal mayor elected in 1997 is affiliated to the

[34] About 98,494 that were created from 2001 through to 2008, and closed down during this period, of which about 15,945 were initially established in the inland area of Portugal, and 73,549 in the coastal area.

most important opposition political party in the Parliament (OPP_c). Appendix E and Appendix F detail the adequacy of this instrumental variable.

The use of data from politics is not new in the literature on taxation and firm creation. For instance, to account for endogeneity of taxation, Da Rin et al. (2011) use four instrumental variables drawn from the political economy literature: (i) ideological orientation of the executives' party; (ii) number of players with veto power in the political system; (iii) degree of government fragmentation, and; (iv) government stability.

4.4.3. Descriptive Statistics

In the year of entry in force of the tax incentives to inlandness firms' entry in non-eligible municipalities increased by about 60 percent, while in eligible municipalities firm entry only increased by about 51 percent (Figure 4.2). However, growth in firm entry from 1995 onwards is similar in both treatment and control groups. Entry in non-eligible municipalities is about four times higher than in eligible municipalities (Panel A of Table 4.3), although the distribution of new firms across different sizes is similar amongst these two groups (Panel B of Table 4.3).

Is the difference in entry between the pre-introduction period and that of post-introduction of the tax incentives significant? Table 4.4 shows that in the post-introduction period (2001 through to 2009), firm entry increased in both eligible and non-eligible municipalities. However, the average number of employees per new firm increased slightly in eligible municipalities, while decreased significantly in non-eligible municipalities. Per capita purchasing power increased by about 20% in beneficiary municipalities, whilst the equivalent increase was 8% in the remaining

municipalities. The same effect is found regarding the density of manufacturing and service plants per square kilometre (urbanisation). However, manufacturing employment per square kilometre (localisation) decreased in the post-implementation period, especially in the case of beneficiary municipalities. At this point, the evidence is inconclusive that firm creation and value generated to municipalities increased as a consequence of the introduction of reduced corporate income tax rates.

4.5. Empirical Results

4.5.1. Effect on Firm Creation

This section starts by testing our main hypothesis using a difference-and-difference approach. Table 4.5 summarises the main estimation. In column (1), model (1) is estimated, while in column (2), model (2) is estimated. Moving to the right, in columns (3), (4) and (5), the treatment effect is narrowed respectively for the periods from 2001 through to 2004, from 2005 through to 2007, and from 2008 through to 2009. One main concern about our setting is the potential influence of financial crisis in 2008 and 2009. In column (5) the treatment effect is narrowed for the years 2008 and 2009, which matches with the second revision of the tax incentives and with the period of the financial crisis. The result obtained in column (1) of Panel A confirms our predictions (H1), which suggests that introducing reduced corporate income tax rates triggers the creation of firms. This positive effect is coherent with most of the literature, although the focus here is on the introduction of reduced corporate income tax rates, rather than on variations in existing tax rate differentials. The results for our control variables show that firm creation is positively influenced by per capita purchasing power and variables

regarding agglomeration economies. Moreover, firm entry appears to increase in municipalities that have a higher population density.

Based on the assumption that our independent variable of interest is endogenous, we might be looking at the data of new firms through a biased perspective. Therefore, Panel B of Table 4.5 summarises the estimation of the 2SLS approach, which reinforces previous results. After controlling for potential endogeneity, we find a statistically positive treatment effect (column 1). As robustness checks, several other sets of specifications are estimated, which are detailed in Section 4.5.7.

The corporate income tax rate applied in eligible municipalities for new firms decreased, from 25 to 15 percent, after the first revision at the end of 2004, and the average tax rate differential increased. A similar tax rate change took place from 2008 onwards. Whether the introduction of reduced corporate income tax rates triggers more entry than further variations in the tax rate differential is key to complement previous literature.

Results in column (2) of Table 4.5 suggest that variations in the corporate income tax rate differential may also benefitted from the creation of new firms in the eligible municipalities, especially the second revision of the tax incentives. Nevertheless, in columns (3) through to (5) we isolate these three treatment periods to perform a detailed analysis on this issue. Results in column (3) support previous conclusions that introducing reduced corporate income tax rates triggers the creation of firms, although the treatment effect is only estimated from 2001 through to 2004. Whether further variations in the reduced corporate income tax rates influenced firm entry is inconclusive (columns 4 and 5 of Panel A, and especially the 2SLS approach in Panel B). That is to say, the period with lower corporate income tax rates in the inland

region, and higher corporate income tax rate differential between regions (from 2008 to 2009), does not correspond to the period during which the treatment effect is higher. This result is somehow consistent with the findings of de Mooij and Nicodème (2008). One possible explanation for this phenomena is that entrepreneurs are mostly sensitive to corporate income tax rates when a tax rate differential is created, whereas the dimension of the differential and further variations over time is not as significant for fostering the creation of firms.

Entry rate per month in eligible municipalities is about 10.5 per each 100,000 inhabitants (Table 4.4). Estimations in column (1) of Panel A of Table 4.5 suggest that introducing reduced corporate income tax rates triggered about 3.1 new firms in beneficiary municipalities. This equates to the implementation of these tax incentives generating 30 percent more firms. At this point, a relevant question to ask is what was the cost of each additional new firm that was established through the introduction of reduced corporate income tax rates? There is no detailed information about either the realised, or the forecasted tax expense of these tax incentives until 2010. We tried to obtain comprehensive date from the Portuguese Tax Administration, with no success. Nonetheless, we had access to a publicly available list of firms that benefitted from the tax incentives during the 2010 fiscal year. This includes about 5.654 firms with a benefit equal or greater to 1,000 Euros. The average benefit from reduced corporate income tax rates for these firms was about 24,000 Euros in 2010. The State Budget account for tax breaks from corporate income tax reductions for tax incentives to inlandness reached 68.5 million euros in 2010, which was just about 0.1 percent of total revenues. The assessment of the cost for the Government of these tax incentives should be viewed in greater depth.

4.5.2. Location of New Firm: Crossing the Border

The Portuguese tax incentives to inlandness influenced regional competition for corporate income tax rates, as neighbouring municipalities were able to compete for corporate income tax rates. Tax incentives benefitted 170 Portuguese municipalities on the mainland, of which 47 had neighbouring municipalities which were not eligible for these tax incentives, as illustrated in the map on the right-hand side of Figure 4.1. That is to say, on the mainland, 87 municipalities (comprised of 47 eligible, and 40 non-eligible municipalities) were competing directly with their neighbouring municipalities, on account of differing corporate income tax rates. Thus, equation (1) is re-estimated, using a subsample obtained by excluding observations from all municipalities that are not located on the border. The treatment effect is captured by the interaction $B_c \times INLAND_{ct}$, where B_c consists of a dummy variable, taking the value one for all the 47 municipalities in the treatment group which borders on at least one municipality in the control group.

Column (6) of Panel A of Table 4.5 summarises the border analysis. The results suggest that there is statistical significance as to whether border competition for corporate income tax rates favours the lower taxed side (H2). The estimated effect is higher than considering all municipalities on the mainland (in column 1), and has statistical significance at conventional levels. For a robust result of border analysis, we present the 2SLS approach in column (6) of Panel B, of Table 4.5. The results obtained remain robust, so we may conclude that border competition for corporate income tax rates was an incentive for new firms to cross the border and to become located in an eligible municipality for the tax incentives to inlandness.

4.5.3. Effect on Job Creation

In column (7) of Table 4.5 the estimation of equation (1) is presented, although the dependent variable is replaced by a measure of employment in new firms at municipality level ($JOBS_{mct}$). The introduction of reduced corporate income tax rates exerts a statistically positive effect on job creation using both the standard OLS approach and the 2SLS approach. Overall, our results mean that the introduction of reduced corporate income tax rates exerts a positive effect on employment (H3), although this conclusion requires further attention, which is detailed in the next section.

4.5.4. Firm Entry by Size

Little is known in the literature about the type of firms that are affected by corporate income tax reductions, and so we thus examine whether the introduction of reduced corporate income tax rates affects firms' size, which is measured as being the number of employees per new firm. This aims to analyse in greater depth the effect of tax changes on job creation. The study of de Mooij and Nicodème (2008) suggests that higher corporate taxation reduce firm entry, especially in the case of medium-sized firms, which is measured as being the number of employees. In a study for Portugal, Branstetter, Lima, Taylor, and Venâncio (2014) suggest that entry deregulation positively affects new firms, with emphasis on firms with two through to five employees (what they call 'marginal firms'). Taking into consideration the findings in the literature, a positive treatment effect is expected for all ranges of sizes, although micro firms are more likely to be affected.[35]

[35] Micro firms are those that have up to 10 employees, according to the EU recommendation 2003/361/EC.

Table 4.6 adds the firm size analysis. Results in columns (1) through to (5) suggest that tax incentives exerted a statistically positive effect for all size ranges. This effect is greater in the range from three to five employees. For firms with more than ten employees, the coefficient is significantly smaller than in other size ranges (column 5). Overall, the results indicate that introducing reduced corporate income tax rates mostly affects micro firms. Somehow contrary to the findings of de Mooij and Nicodème (2008), larger firms are not heavily influenced by the introduction of reduced corporate income tax rates.

4.5.5. Firm Entry by Industries and Level of Technological Intensity

Firm creation as a consequence of introducing reduced corporate income tax rates might be concentrated in specific industries, and the potential positive effect on regional economic development might differ according to the level of technological intensity of new firms. The classification of the level of technological intensity that is used is that of the OECD (2002), which defines four levels: high; medium-high; medium-low, and; low level of technological intensity. The first two levels are merged, as well as the latter ones, thus creating two groups of technological intensity. For a detailed analysis of the effect per industry, selected industries are those that exhibit higher aggregate firm creation: wholesale trade; retail trade; construction; manufacturing, and; services.

Panels A and B of Table 4.7 summarises these results. There is no significant effect for the group of firms classified with high and medium-high in terms of technological intensity, while significantly positive for the group of firms classified as low and medium-low. The analysis on this issue has some limitations as there is no information available for assessing the level of technological intensity for about 87 percent of new

firms. With regard to industry sectors, the introduction of reduced corporate income tax rates appears to exert a positive and statistically significant effect in all industry sectors considered in Table 4.7: wholesale, retail trade, construction, manufacturing, and services.

4.5.6. Survival of New Firms

Table 4.8 summarises nine survival analyses which combine different periods of survival and a different sample composition. Specifically, it combines firms' survival: from the year of entry through to 2009 (Panel A); for both the first (Panel B) and the second year after entry (Panel C). These time ranges are matched with three samples: all sample; a subsample for micro firms up to 5 employees, and; a subsample for the remaining firms (more than 5 employees). The results using the entire sample (Panel A) suggest that the overall survival likelihood for new firms located in eligible municipalities for the tax incentives is about 13.4 percent greater than new firms that are located in non-eligible municipalities (Cox hazard ratio of 0.866), which does not support the fourth research hypothesis. The survival likelihood was improved for the first year after entry (Panel B – Cox hazard ratio of 0.895). There is no statistical significance to assess whether the survival likelihood improved after the first year. The results in Panel C highlight that there is statistical significance to support both an increase in survival likelihood from the entry year up until the second year (Cox hazard ratio of 0.870), and a decrease in the survival likelihood after the second year of creation (Cox hazard ratio of 1.048). That is to say, the survival likelihood appear to improved 13.0% for the first two years, while decreased 4.8% in the following years, in an overall positive effect on survival likelihood of about 8.2%. The analyses using both firms with up to 5 employees and firms with more than 5 employees present similar

results in Panel A, while slightly different in the other Panels. Our results are in contrast to a series of empirical studies which claim that smaller firms in less technological intensive industries are less likely to survive (e.g., Agarwal and Audretsch (2001)), although life cycle stage of each industry was not taken into consideration.

4.5.7. Robustness Checks

This section runs a battery of robustness checks. The tax incentives were intended to enter in force in 2000, although they effectively entered in force in 2001. Therefore, in columns (1) and (2) of Table 4.9, this time postponement is assessed. Firstly, in column (1), the year of 2000 is excluded. Secondly, in column (2), the treatment effect starts in 2000, rather than in 2001. The rational for these estimations arises from public knowledge about the introduction of tax incentives. Consequently, firms aiming to qualify for tax incentives might be created in ahead of the publication of the list of beneficiary municipalities. In both estimations, the treatment effect is positive, and statistically significant. From 2009 onwards, eligible municipalities changed slightly. To avoid misspecification, the year of 2009 is excluded in column (3). The treatment effect remains statistically positive.

Our proxy for firm entry – the number of new firms per 100,000 inhabitants – is widely used in studies about entrepreneurship, and is similar to the average entry rate used in the study of Djankov et al. (2010). To strengthen our results, column (4) presents the estimation of equation (1), using the absolute number of new firms per month in each municipality as the dependent variable. Similar to previous analyses, both the standard OLS approach and the 2SLS approach show a positive effect, which is robust for both approaches.

The difference-in-differences model in previews analyses contains a fixed effect specification for municipality-variant characteristics, and a double quadratic time trend. Other time trend specifications, such as linear and cubic ones are presented in columns (5) and (6), respectively. Both time trends show a positive treatment effect on the outcome, as expected. The fixed time specification in column (7) also presents a positive signal for the treatment effect in both estimations (Panel A and B), although it is not robust. In this study, the fixed effect specification for time evidences multicollinearity issues with other controls, as there are about 180 time points over 275 locations.

Previous analyses supported the view that firms cross the border to be located on the lower taxed area. To explore this analysis in greater depth, municipalities with neighbouring municipalities which levy different corporate tax rates are excluded in column (8). The excluded municipalities are represented by the light grey and dark grey area on the right-hand side map of Figure 4.1. The results show a positive and statistically significant treatment effect, although smaller than those estimated in Table 4.5. Thus, this result reinforces that border competition on corporate income tax rates exerts more influence on firm entry.

Another concern in our estimation strategy is that the two major Portuguese municipalities – Lisbon and Porto – are outliers when it comes to considering municipality-level characteristics. They exhibit higher per capita purchasing power, absorb most of the overall credit conceded in Portugal, and are amongst the cities that have the greatest population, and with more entry (INE, 2011). Therefore these municipalities are studied here with particular attention. According to the literature on agglomeration economies, these two municipalities may well influence the creation of

new businesses. Thus, two vectors are added to equation (1) which contain the physical distance in kilometres between the Lisbon or Porto municipalities and the municipality where new firms are located. Coefficients in column (9) of Table 4.9 are statistically significant, with the distance to Lisbon and to Porto having both a positive effect. Column (10) of Table 4.9 presents a positive treatment effect, excluding observations from Lisbon and Porto.

The district of Faro in the region of Algarve contains 16 municipalities. Another concern is that in 6 of these municipalities only a few parishes benefitted from the tax incentives, and 4 of these municipalities were coded as being non-eligible in this study. In column (11), the district of Faro is excluded, as well as the neighbouring district of Beja. The treatment effect remains positive and robust.

To control for country specificities, other country level controls are included in column (12), such as: (i) the logarithm of gross domestic product (GDP) per NUTS (nomenclature of territorial units for statistics) level 3 territorial unit; (ii) a measure of economic freedom in the country; (iii) a measure of corruption at country level, and; (iv) a measure of country-level tax burden. As there is no availability of data for all years, the time range runs from 1997 to 2009. With the inclusion of additional country-level controls, the treatment effect remains robust. All country level controls are statistically significant. Proxies for GDP and tax burden at country level are positively associated with firm entry, whilst remaining controls exhibit a negative association.

In a study of local tax competition in Germany, Janeba and Osterloh (2013) suggest that intensity of competition for firms might be explained by the size and location of municipalities. While the location of regions is one of the focus of this study through

agglomeration economies measures, the municipality size is included here as a robustness check. We add a variable to equation (1) which contains the perimeter territory of each municipality (the result is not reported). Contrary to the findings of Janeba and Osterloh (2013), the size of municipalities is not influential for firm entry.

4.6. Conclusion

This paper analyses whether the introduction of reduced corporate income tax rates at regional level triggers firm creation, using a quasi-natural experiment approach, and a unique dataset, which virtually covers all the private firms in Portugal. The Portuguese tax incentives to inlandness are used as proxy for the introduction of reduced corporate income tax rates. The tax incentives divided the country into two parts, the inland region which benefitted from this fiscal policy, and the coastal region. As a result, many municipalities located in the inland region competed directly with their neighbouring municipalities in the coastal region, exclusively for tax reasons. To obtain a robust difference-in-differences estimation, an instrumental variable is used to control for the potential effects of unobserved characteristics, which is drawn from politics.

Previous empirical studies reach a consensus that corporate income tax rates exert a negative, yet marginal effect on entrepreneurial activity, as is pointed out, for example, by the influential study of Djankov et al. (2010). Our results suggest that introducing reduced corporate income tax rates exerts a positive and robust effect on firm entry. This effect is significant in the period just after the creation of a tax rate differential between regions, whilst it is inconclusive whether further variations in the tax rate differential triggers the creation of more firms. This finding contrasts with the existing empirical evidence, as it is claimed that what really triggers the creation of new firms is

when the tax rate differential between regions is created. Moreover, there is evidence to support the view that entrepreneurs cross the border to be located in a neighbouring municipality, which subjects firms to reduced corporate income tax rates. Job creation appears to be positively affected.

Collectively, our findings are in line with the traditional tax competition literature and they highlight the influence of agglomeration economies in taking advantage of the introduction of tax incentives, which is consistent with the findings of Devereux et al. (2007). Specifically, the traditional tax competition literature holds for the border competition analysis. The two proxies for agglomeration economies appear to positively influence the creation of new firms. New firms are typically small, and are categorised as having low or medium-low levels of technological intensity. Another interesting finding is that survival likelihood is improved for new firms that are located in municipalities that benefit from tax changes. A controversy in the literature arises from the small size and the weak innovative ability of new firms (Shane, 2009). Our findings somewhat support these arguments.

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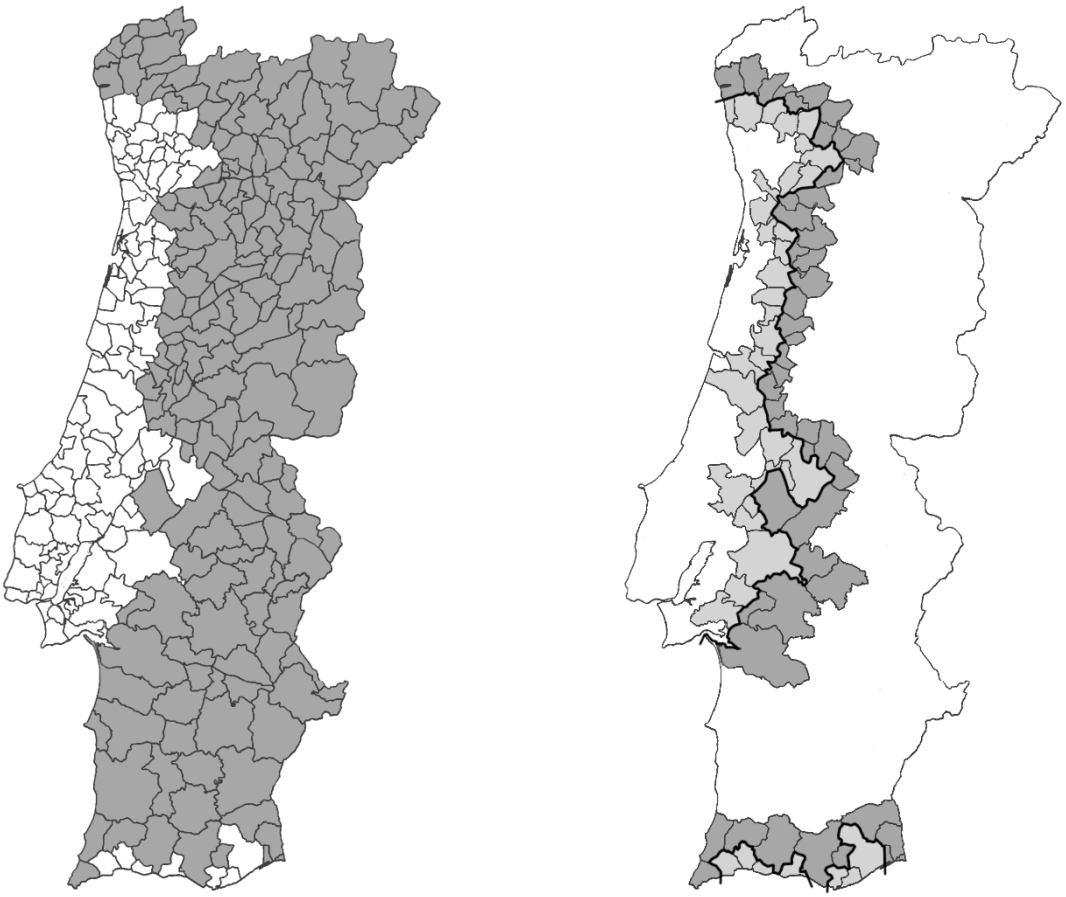
Appendix D. Figures and Tables

Figure 4.1: Map of eligible and non-eligible municipalities for the 'Portuguese tax incentives to inlandness'

On the map on the left hand side, eligible municipalities for the tax incentives are marked in grey (170 out of 275). The thick line in the right-hand map define the borders between eligible (dark – 47 out of 170) and non-eligible (light – 40 out of 105) municipalities. Three municipalities are excluded, as they were only formed in 1998.



Source: The authors

Table 4.1: Portuguese statutory corporate income tax rates and reduced corporate income tax rates applicable in eligible municipalities

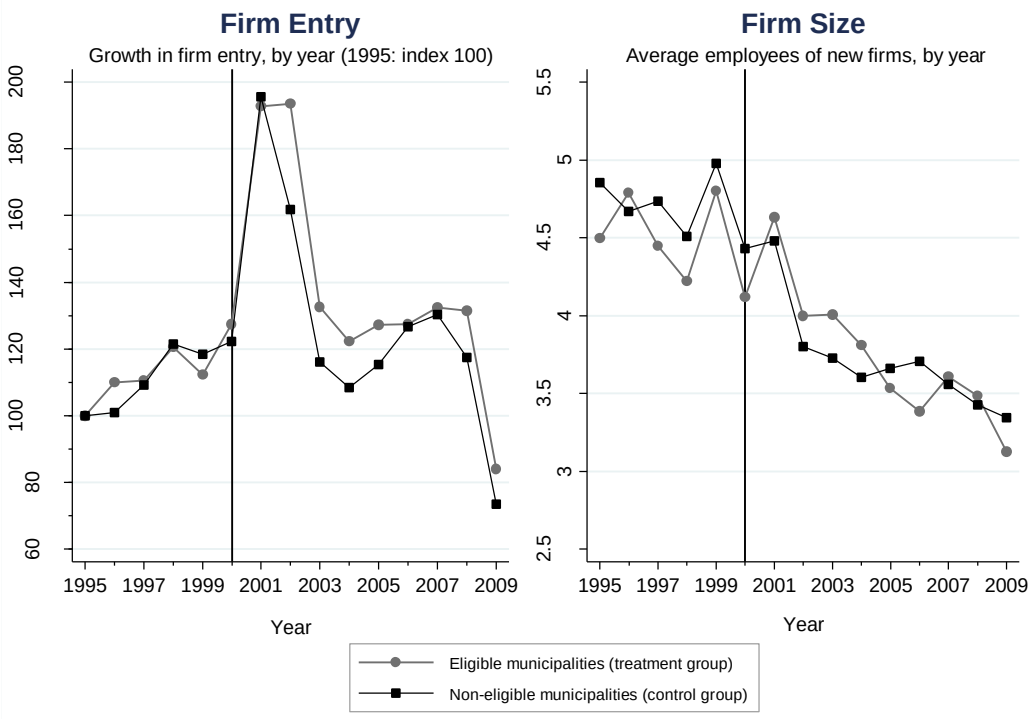
Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Statutory tax rate	36	36	34	34	34	32	32	30	30	25	25	25	25	25	25[(1)]
Reduced tax rate	n/a						25	25	25	25	15	15	15	10	10
Differential	n/a						7	5	5	0	10	10	10	15	15

Notes: The first row presents the statutory corporate income tax rate that is applicable before 2001 in all municipalities on the Portuguese mainland, and after 2001 in non-eligible municipalities for the *Portuguese tax incentives to inlandness*. The second row presents the corporate income tax rate that is applicable for new firms established in eligible municipalities. It was also introduced reduced corporate income tax rates for established firms from 2005 onwards, although the focus here is on new firms. The third row presents the differential between statutory and reduced corporate income tax rates.

(1) Tax rate of 12.5% for taxable income until €12,500.

Figure 4.2: Firm entry and firm size, in Portugal from 1995 to 2009

These figures exhibit the growth in firm's entry and average firm's size in eligible and non-eligible municipalities for the Portuguese tax incentives to inlandness. While the left-hand side figure relates to an index of growth in firm entry, the figure on the right-hand side exhibits the average firm size of entrants. Excluded are sole proprietorships.



Source: Ministry of Solidarity, Employment and Social Security, author's compilation

Table 4.2: Data and variable construction

Variable	Source	Definition
E_{mct}	a	Entry rate, measured as the number of new firms per 100,000 inhabitants, per month in each municipality.
$No.E_{mct}$	a	Number of entry, measured as the number of new firms per month in each municipality.
$JOBS_{mct}$	a	Employees. In the month of entry, measured by the number of employees per new firm at the end of the fiscal year of entry, per municipality.
$INLAND_{ct}$	–	Inland. A dummy variable, taking the value 1 if the firm is located in an eligible municipality for the *Portuguese tax incentives to inlandness* from 2001 onwards; and 0 otherwise.
B_c	–	Border. A dummy variable, taking the value 1 for all the 47 eligible municipalities which border on to at least one non-eligible municipality.
$DENSITY_{ct}$	b	Population density, calculated as estimated annual average resident population, divided by perimeter territory. The variable used in this paper is further divided by 1,000 (inhabitants).
$P.POWER_{ct}$	b	Per capita purchasing power by municipality (INE, 2011), calculated as PP = (1 + CV*Factor1)/(1 + CV*FACT1Pond)*100, in which CV is a variation coefficient which is multiplied by the first factor (Factor1), which is extracted from a principal component analysis that includes eighteen municipality-level variables. FACT1Pond is the sum of multiplication between Factor1 and the weight of population per municipality. The statistic used in this paper is further divided per 1,000 (inhabitants).
D_LISBON_c	b	Distance in kilometres from municipality *c* to the Lisbon municipality.
D_PORTO_c	b	Distance in kilometres from municipality *c* to the Porto municipality.
$URBANIZ_{ct}$	b	Urbanisation economies. The density of manufacturing and service plants per square kilometre, by municipality.
$LOCALIZ_{ct}$	b	Localisation Economies. A log of total manufacturing employment per square kilometre, by municipality.
GOV_c	c	Government. A dummy variable taking the value 1 from 2001 onwards if the political party which won the local elections of 1997 for the mayor is the same as the political party that supports the government from 1995 to 2002; and 0 otherwise.
OPP_c	c	Opposition party. A dummy variable, taking the value 1 from 2001 onwards if the political party which won the local elections of 1997 for the mayor is the same as the most important opposition political party in the Parliament from 1995 to 2002; and 0 otherwise.
$T2_t$	–	Period 2. A dummy variable taking the value 1 for period from 2005 to 2007; and 0 otherwise.
$T3_t$	–	Period 3. A dummy variable taking the value 1 for period from 2008 to 2009; and 0 otherwise.
IND_i	a	Industry code with two digits, containing 57 different industries.
$TECH_i$	–	Technology. Firms' level of technological intensity (high-, medium-high-, medium-low-, and low-technology industry) accordingly to the classification of OECD (2002). In this paper only two groups were used, by merging data on firms with high and medium-high technological level, and firms with a medium-low and low technological level.
m	–	Month of entry.
t	–	Year of data.
c	–	Municipality where a firm is located.

Notes:

[a] Ministry of Solidarity, Employment and Social Security (*Quadros de Pessoal* dataset).

[b] INE – Portuguese National Statistical Institute.

[c] CNE – Portuguese National Election Commission

Table 4.3: Number of new firms pre and post the introduction of reduced corporate income tax rates (1995 through to 2009)

PANEL A: New firms per year

No. new firms	**1995-2009**	**1995-2000**	**2001-2009**	**2001-2004**	**2005-2007**	**2008-2009**
	All period	***Pre-programme period***	***Programme period***			
Eligible municipalities	49,773	17,606	32,167	16,581	10,012	5,574
Non-eligible municipalities	210,503	77,847	132,656	67,399	43,141	22,116
All entry	260,276	95,453	164,823	83,980	53,153	27,690

PANEL B: New firms per size from 2001 to 2009

Employees per new firm in the entry year	**Average size**	**% One employee**	**% Two employees**	**% Three to five employees**	**% Six to ten employees**	**% More than ten employees**
Eligible municipalities	3.81	31.6	24.7	28.6	10.3	4.8
Non-eligible municipalities	3.77	32.2	25.2	27.6	9.9	5.1

PANEL C: Descriptive statistics

Variables	**No.**	**Mean**	**Standard Deviation**	**1st Quartile**	**Median**	**3rd Quartile**
Dependent variables						
E_{mct}	49,500	11.73	12.64	0.00	9.62	17.18
$No.E_{mct}$	49,500	5.26	12.95	0.00	2.00	5.00
$JOBS_{mct}$	49,500	21.55	66.11	0.00	4.00	18.00
Controls						
$DENSITY_{ct}$	4,125	0.47	1.07	0.08	0.17	0.37
$P.POWER_{ct}$	4,125	0.07	0.03	0.05	0.06	0.08
$URBANIZ_{ct}$	4,125	8.45	32.51	0.80	1.90	5.68
$LOCALIZ_{ct}$	4,125	2.15	1.84	0.74	2.03	3.38
D_LISBON_{c}	275	249.0	120.8	165.0	255.0	344.0
D_PORTO_{c}	275	221.6	140.5	109.0	197.0	312.0
GOV_{c}	275	0.44	0.50	0.00	0.00	1.00
OPP_{c}	275	0.37	0.48	0.00	0.00	1.00

Notes:

Panel A presents the number of new firms in each period per eligible and non-eligible municipalities. In **Panel B** the number of employees per new firm is described. **Panel C** presents descriptive statistics for all the variables used throughout this study. Excluded are sole proprietorships.

Table 4.4: Descriptive statistics at municipality level

Average per municipality / month (year)	**1995-2000**	**2001-2009**	**Difference**
E_{mct}			
Eligible municipalities (Inland)	8.649	10.471	1.822***
	(0.1056)	(0.0958)	(0.1456)
Non-eligible municipalities	13.859	15.664	1.804***
	(0.1315)	(0.1183)	(0.1803)
$No.E_{mct}$			
Eligible municipalities (Inland)	1.438	1.752	0.314***
	(0.0240)	(0.0240)	(0.0353)
Non-eligible municipalities	10.297	11.698	1.401***
	(0.2260)	(0.1771)	(0.2848)
$JOBS_{mct}$			
Eligible municipalities (Inland)	6.424	6.683	0.259
	(0.1654)	(0.1466)	(0.2246)
Non-eligible municipalities	48.290	44.119	-4.171***
	(1.3770)	(0.7818)	(1.4768)
$DENSITY_{ct}$			
Eligible municipalities (Inland)	0.134	0.132	-0.002
	(0.0010)	(0.0009)	(0.0014)
Non-eligible municipalities	0.992	1.030	0.038
	(0.0185)	(0.0147)	(0.0235)
$P.POWER_{ct}$			
Eligible municipalities (Inland)	0.052	0.062	0.010***
	(0.0002)	(0.0001)	(0.0002)
Non-eligible municipalities	0.084	0.091	0.007***
	(0.0004)	(0.0003)	(0.0005)
$URBANIZ_{ct}$			
Eligible municipalities (Inland)	1.485	1.639	0.154***
	(0.0150)	(0.0133)	(0.0204)
Non-eligible municipalities	18.838	20.054	1.217
	(0.5735)	(0.4801)	(0.7517)
$LOCALIZ_{ct}$			
Eligible municipalities (Inland)	1.193	1.114	-0.079***
	(0.0116)	(0.0091)	(0.0147)
Non-eligible municipalities	3.848	3.736	-0.112***
	(0.0169)	(0.0128)	(0.0209)

Notes:

The first column presents statistics before the enter in force of the *Portuguese tax incentives to inlandness*, and the second presents data post the introduction of the tax incentives, whilst the third column computes the difference between the two periods.

Standard errors are in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively. The symbols presented are for a two-tailed test.

Table 4.5: Effect on firm creation and job creation

PANEL A: Firm entry per period and location

Dependent variable:	E_{mct}						$JOBS_{mct}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$INLAND_{ct}$	3.136***	3.122***	4.974***				6.488***
	(0.287)	(0.292)	(0.404)				(1.408)
$INLAND_{ct} \cdot T2_t$		-0.086		0.077			
		(0.252)		(0.288)			
$INLAND_{ct} \cdot T3_t$		1.263***			1.459***		
		(0.392)			(0.296)		
$B_c \cdot INLAND_{ct}$						4.239***	
						(0.549)	
$P.POWER_{ct}$	3.718	4.062	17.794	10.808	14.651	-15.742	561.607**
	(10.866)	(11.018)	(20.694)	(13.904)	(10.985)	(22.675)	(239.568)
$DENSITY_{ct}$	1.891	2.141	8.475***	1.502	0.196	14.845	48.286
	(1.388)	(1.425)	(3.207)	(1.594)	(1.282)	(12.351)	(40.794)
$URBANIZ_{ct}$	0.113***	0.110***	0.212**	0.069	0.075**	0.782***	2.172**
	(0.042)	(0.040)	(0.095)	(0.053)	(0.033)	(0.289)	(0.840)
$LOCALIZ_{ct}$	0.821**	0.804**	1.357*	0.956**	0.629	2.134***	4.360***
	(0.386)	(0.378)	(0.694)	(0.471)	(0.408)	(0.774)	(1.519)
Other Controls	YES	YES	YES	YES	YES	YES	YES
Time Range	1995-2009	1995-2009	1995-2004	1995-2007	1995-2009	1995-2009	1995-2009
Treatment effect	2001-2009	2001-2009	2001-2004	2005-2007	2008-2009	2001-2009	2001-2009
N	49,500	49,500	33,000	42,900	49,500	15,660	49,500
Adjusted R^2	0.331	0.332	0.377	0.346	0.329	0.373	0.524
N treated	18,360	18,360	8,160	6,120	18,360	5,076	18,360

PANEL B: Firm entry per period and location (2SLS IV approach)

Dependent variable:	E_{mct}						$JOBS_{mct}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$INLAND_{ct}$	8.804***		15.605***				10.611*
	(1.948)		(3.295)				(6.047)
$INLAND_{ct} \cdot T2_t$				-34.89***			
				(9.530)			
$INLAND_{ct} \cdot T3_t$					-56.72***		
					(16.474)		
$B_c \cdot INLAND_{ct}$						10.550***	
						(3.212)	
All Controls	YES		YES	YES	YES	YES	YES
Time Range	1995-2009		1995-2004	1995-2007	1995-2009	1995-2009	1995-2009
Treatment effect	2001-2009		2001-2004	2005-2007	2008-2009	2001-2009	2001-2009
N	49,500		33,000	42,900	49,500	15,660	49,500
Adjusted R^2	0.321		0.344	0.074	0.329	0.362	0.524
N treated	18,360		8,160	6,120	18,360	5,076	18,360

Notes: Panel regressions with municipality and month of entry fixed effects specification, quadratic time trend, and an additional quadratic time trend for the treatment group. In column (1) is presented the estimation of model (1), while model (2) is presented in column (2). In columns (3) through to (5) we isolate the three treatment periods to perform a detailed analysis on whether the introduction of reduced corporate income tax rates triggers more entry than further

variations in the tax rate differential between regions. The border analysis is presented in column (6), and column (7) presents model 1 with *JOBS* as dependent variable.

$$E_{mct}/JOBS_{mct} = \beta_1 INLAND_{ct} + \alpha_0 + CONTROLS_{ct} + \varepsilon_{mct}$$

The dependent variable in columns (1) through to (6) is: *E* = number of new firms per 100,000 inhabitants per month in each municipality. In column (7), the dependent variable is: *JOBS* = proxy for the number of employees of new firms per municipality. The independent variable of interest is: *INLAND* = a dummy variable taking the value 1 if the firm is located in an eligible municipality for the Portuguese tax incentives to inlandness from 2001 to 2009, and 0 otherwise. *T2* = a dummy variable taking the value one for the period from 2005 to 2007; *T3* = a dummy variable taking the value one for the period from 2005 to 2007; *B* = a dummy variable taking the value one for all the 47 municipalities in the treatment group with borders to at least one municipality in control group. **Panel A** presents the standard difference-in-differences (DiD) estimation, while **Panel B** presents the 2SLS approach. As an instrumental variable we use *OPP* = a dummy variable taking the value one from 2001 onwards if the municipal mayor elected in 1997 is affiliated to the most important opposition political party in the Parliament; and 0 otherwise. For parsimony, coefficients for some controls are not reported. Standard errors clustered at the municipality level are in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 4.6: Effect on firm creation: by firm size

PANEL A: Firm size

	One employee	Two employees	Three to five employees	Six to ten employees	More than ten employees
	(1)	(2)	(3)	(4)	(5)
$INLAND_{ct}$	0.498***	0.612***	1.455***	0.437***	0.133**
	(0.127)	(0.114)	(0.130)	(0.066)	(0.052)
All Controls	YES	YES	YES	YES	YES
N	49,500	49,500	49,500	49,500	49,500
Adjusted R^2	0.123	0.135	0.169	0.089	0.067
N treated	18,360	18,360	18,360	18,360	18,360

PANEL B: Firm size (2SLS IV approach)

	One employee	Two employees	Three to five employees	Six to ten employees	More than ten employees
	(1)	(2)	(3)	(4)	(5)
$INLAND_{ct}$	2.051***	1.137**	3.863***	1.287***	0.466**
	(0.674)	(0.491)	(0.822)	(0.341)	(0.232)
All Controls	YES	YES	YES	YES	YES
N	49,500	49,500	49,500	49,500	49,500
Adjusted R^2	0.119	0.134	0.160	0.086	0.066
N treated	18,360	18,360	18,360	18,360	18,360

Notes: Panel regressions with municipality and month of entry fixed effects specification, quadratic time trend, and an additional quadratic time trend for the treatment group. In each column is considered different sizes of new firms in the entry year.

$E_{mct} = \beta_1 INLAND_{ct} + \alpha_0 + CONTROLS_{ct} + \varepsilon_{mct}$, by different levels of $JOBS_{mct}$

The dependent variable in columns (1) through to (5) is: *E* = number of new firms per 100,000 inhabitants per month in each municipality. The independent variable of interest is: *INLAND* = a dummy variable taking the value 1 if the firm is located in an eligible municipality for the Portuguese tax incentives to inlandness from 2001 to 2009, and 0 otherwise. **Panel A** presents the standard difference-in-differences (DiD) estimation, while **Panel B** presents the 2SLS approach. As instrumental variable is used *OPP* = a dummy variable taking the value one from 2001 onwards if the municipal mayor elected in 1997 is affiliated to the most important opposition political party in the Parliament; and 0 otherwise.

Coefficients for controls are not reported. Standard errors clustered at the municipality level are in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 4.7: Effect on firm creation: by level of technological intensity, and industry

PANEL A: Level of technological intensity and industry

	High and medium-high	Low and medium-low	Wholesale trade	Retail trade	Construction	Manufacturing	Services
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$INLAND_{ct}$	-0.002	0.174**	0.270***	0.810***	1.061***	0.178**	0.716***
	(0.020)	(0.080)	(0.066)	(0.104)	(0.146)	(0.087)	(0.108)
N	49,500	49,500	49,500	49,500	49,500	49,500	49,500
Adj. R^2	0.040	0.120	0.092	0.104	0.133	0.127	0.146
N treated	18,360	18,360	18,360	18,360	18,360	18,360	18,360

PANEL B: Level of technological intensity and industry (2SLS IV approach)

	High and medium-high	Low and medium-low	Wholesale trade	Retail trade	Construction	Manufacturing	Services
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$INLAND_{ct}$	-0.081	0.732*	1.046***	2.083***	3.446***	0.795*	1.579***
	(0.087)	(0.445)	(0.271)	(0.523)	(0.831)	(0.480)	(0.527)
All Controls	YES	YES	YES	YES	YES	YES	YES
N	49,500	49,500	49,500	49,500	49,500	49,500	49,500
Adj. R^2	0.039	0.119	0.088	0.100	0.120	0.126	0.145
N treated	18,360	18,360	18,360	18,360	18,360	18,360	18,360

Notes:

Panel regressions with municipality and month of entry fixed effects specification, quadratic time trend, and an additional quadratic time trend for the treatment group. In columns (1) and (2) is considered entry per technological intensity, while columns (3) through to (7) is considered entry per industry. The level of technological intensity follows the classification of the OECD (2002).

$E_{mct} = \beta_1 INLAND_{ct} + \alpha_0 + CONTROLS_{ct} + \varepsilon_{mct}$, per different levels of technological intensity and per industries

The dependent variable in columns (1) through to (5) is: *E* = number of new firms per 100,000 inhabitants per month in each municipality. The independent variable of interest is: *INLAND* = a dummy variable taking the value 1 if the firm is located in an eligible municipality for the Portuguese tax incentives to inlandness from 2001 to 2009, and 0 otherwise. **Panel A** presents the standard difference-in-differences (DiD) estimation, while **Panel B** presents the 2SLS approach. As instrumental variable is used *OPP* = a dummy variable taking the value one from 2001 onwards if the municipal mayor elected in 1997 is affiliated to the most important opposition political party in the Parliament; and 0 otherwise.

Coefficients for controls are not reported. Standard errors clustered at the municipality level are in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 4.8: Effect on new firms' survival likelihood

Characteristics	All sample			Firms with 5 or less employees			Firms with more than 5 employees		
	Coeff. estimate	**Robust s.e.**	**Hazard ratio**	**Coeff. estimate**	**Robust s.e.**	**Hazard ratio**	**Coeff. estimate**	**Robust s.e.**	**Hazard ratio**
PANEL A:									
Inland	-0.1437	0.0218	0.866***	-0.1492	0.0230	0.861***	-0.1245	0.0663	0.883*
PANEL B:									
Inland (first year)	-0.1106	0.0231	0.895***	-0.1091	0.0244	0.897***	-0.1107	0.0714	0.895
Inland (after)	-0.0064	0.0264	0.994	0.0108	0.0283	1.011	-0.1164	0.0727	0.890
PANEL C:									
Inland (first two years)	-0.1397	0.0174	0.870***	-0.1362	0.0185	0.873	-0.1531	0.0511	0.858**
Inland (after)	0.0469	0.0235	1.048**	0.0689	0.0255	1.071***	-0.0876	0.0603	0.916
Controls in all Panels									
$P.POWER_{ct}$	YES			YES			YES		
$DENSITY_{ct}$	YES			YES			YES		
$URBANIZ_{ct}$	YES			YES			YES		
$LOCALIZ_{ct}$	YES			YES			YES		
N (all Panels)	89,494			76,613			12,881		
N treated (all Panels)	15,945			13,774			2,171		

Notes:

Cox proportional hazard analysis of new firms' lifetime. The sample consists of new firms between 2001 and 2008. There are nine different survival analysis.

$h(t) = h_0(t)exp(b_0 + b_1 INLAND_{ct} + b_2 CONTROLS_{ct})$

The dependent variable comprises firms' lifetime in years, while the independent variable of interest is a dummy variable taking the value one if the firm was located in an eligible municipality for the *Portuguese tax incentives to inlandness*. Controls used are fixed effects specification for year of entry, as well as per capita purchasing power at municipality level, population density at municipality level, measures of urbanisation and location economies. We let treatment to be a time-varying covariate.

A hazard ratio higher than 1 means that survival rate is negatively affected by treatment. The hazard ratio of about 0.866 means that likelihood of survival is about 86.6% in treatment group comparing with control group, which means that survival likelihood in eligible municipalities for the tax incentives is about 13.4% greater than for new firms located in non-eligible municipalities.

Panel A comprises an analysis from the year of entry through to 2009. In **Panel B** is included in the first row an analysis for the first year after entry and in the second row is considered the treatment effect for the following years. The Cox hazard ratio of 0.895 suggest that survival likelihood improved about 10.5% in the first year after entry, while for the following years the survival likelihood improved more 0.6% (Coz hazard ratio of 0.994), in a total of improvement of 11.1%.

In **Panel C** is included in the first row an analysis up to the second year after entry and in the second row is considered the treatment effect for the following years.

Coefficients for controls are not reported. Robust standard errors are in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Table 4.9: Robustness check

PANEL A: Robustness checks

	Excluding 2000	Treatment in 2000	Excluding 2009	No. entry	Linear time trend	Cubic time trend	Time fixed effects	Excluding Eligible on Border	Distance to Lisbon and Porto	Excluding Lisbon and Porto	Excluding Faro & neighbouring district	Other country level controls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$INLAND_{ct}$	3.210***	2.201***	3.033***	0.684***	4.539***	3.473***	0.011	2.576***	3.136***	3.168***	3.201***	3.970***
	(0.328)	(0.279)	(0.301)	(0.171)	(0.296)	(0.328)	(0.331)	(0.312)	(0.287)	(0.288)	(0.300)	(0.317)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	46,200	49,500	46,200	49,500	49,500	49,500	49,500	41,040	49,500	49,140	44,100	42,900
Adjusted R^2	0.330	0.330	0.338	0.782	0.318	0.332	0.386	0.340	0.331	0.326	0.324	0.337
N treated	18,360	20,400	16,320	18,360	18,360	18,360	18,360	13,284	18,360	18,360	15,876	18,360

PANEL B: Robustness checks (2SLS IV approach)

	Excluding 2000	Treatment in 2000	Excluding 2009	No. entry	Linear time trend	Cubic time trend	Time fixed effects	Excluding Eligible on Border	Distance to Lisbon and Porto	Excluding Lisbon and Porto	Excluding Faro % neighbouring district	Other country level controls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$INLAND_{ct}$	10.946***	7.016***	8.761***	2.888***	10.908***	7.269***	4.312	10.961***	8.804***	8.795***	7.844***	10.208***
	(3.008)	(1.875)	(1.936)	(1.050)	(1.905)	(1.443)	(4.815)	(3.382)	(1.948)	(1.936)	(1.579)	(2.623)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	46,200	49,500	46,200	49,500	49,500	49,500	49,500	41,040	49,500	49,140	44,100	42,900
Adjusted R^2	0.314	0.323	0.327	0.781	0.303	0.327	0.380	0.318	0.321	0.316	0.317	0.326
N treated	18,360	20,400	16,320	18,360	18,360	18,360	18,360	13,284	18,360	18,360	15,876	18,360

Notes:

Panel regressions with municipality and month of entry fixed effects specification, quadratic time trend, and an additional quadratic time trend for the treatment group.

The year of 2000 is excluded in column (1), and in column (2) the treatment effect is from 2000 onwards rather than from 2001. The rational for columns (1) and (2) is that the tax incentives effectively entered in force in 2001, although it was scheduled to enter in force in 2000. From 2009 onwards, the list of eligible municipalities for the tax incentives changed slightly. Thus, in column (3) the year of 2009 is excluded. In column (4), the dependent variable is the absolute number of new firms per municipality in each month. Instead of a quadratic time trend setting, column (5) contains a linear

time trend and an additional linear time trend for the treatment group. Similarly, column (6) contains a cubit time trend including an additional quadratic time trend for the treatment group. Column (7) contains a time fixed effects, instead of month of entry fixed effects, quadratic time trend, and quadratic time trend for treatment group. As firms appear not to cross the border to be located on the lower taxed area (inland region), in column (8) eligible municipalities with borders to non-eligible municipalities are excluded. Column (9) includes two vectors for the distance in kilometres from municipality *c* and the municipalities of Lisbon and Porto. In column (10), the municipalities of Lisbon and Porto are excluded. In column (11), the municipalities in the Faro district (Algarve region) and in the neighbouring district are excluded. Column (12) contains other controls, such as: the logarithm of gross domestic product per NUTS 3 (form the Portuguese National Statistical Institute); a measure of economic freedom in the country (index from The Wall Street Journal and The Heritage Foundation); a measure of corruption at country level (Corruption Perception Index from Transparency International), and; a measure of country level tax burden (total tax revenue as a percentage of GDP from the OECD). Because there is no availability of data for all years, the sample only covers the years from 1997 to 2009.

$E_{mct} = \beta_1 INLAND_{ct} + \alpha_0 + CONTROLS_{ct} + \varepsilon_{mct}$

The dependent variable in columns all columns except (2) is: *E* = number of new firms per 100,000 inhabitants per month in each municipality. In column (2), the dependent variable is: *NoE* = number of new firms per month in each municipality. The independent variable of interest is: *INLAND* = a dummy variable taking the value 1 if the firm is located in an eligible municipality for the Portuguese tax incentives to inlandness from 2001 to 2009, and 0 otherwise. **Panel A** presents the standard difference-in-differences (DiD) estimation, while **Panel B** presents the 2SLS approach. As instrumental variable is used being *OPP* = a dummy variable taking the value one from 2001 onwards if the municipal mayor elected in 1997 is affiliated to the most important opposition political party in the Parliament; and 0 otherwise.

Coefficients for controls are not reported. Standard errors clustered at the municipality level are in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

Appendix E. The Portuguese tax incentives to inlandness

Realising that Portugal had significant disparities in several regions, the Portuguese State Budget for 1998 authorised the Government to legislate regarding an incentive system for micro and small firms.[36] Leveraging this legislative authorisation, the most important opposition political party in the Parliament issued a Member's bill in 1998 (Projeto de Lei No. 522/VII). The goal was to fight human desertification and to trigger the economic recovery of less-favoured regions in the inland region of Portugal. This legislative initiative was positively assessed by two parliamentary commissions.

During the plenary session that discussed and voted on this Members' bill, with regard to the general principles, a member of a minor opposition political party claimed that the bill was in effect issued, as the Government had failed to comply with the legislative authorisation.[37] Neither the Government, nor the corresponding political party supported or discarded the bill.[38] In fact, the political party supporting the Government never voted favourably for the bill either for the general principles, or during the voting on the details. Notwithstanding, they considered as crucial the goals of

[36] Article 32 of Law No. 127-B/97, of December 20th.

[37] Plenary session in the Parliament of June 24th, 1998. Speech of a member of a minor opposition political party, "*(...) este projecto de lei tem razão de ser porque o Governo não cumpriu aquilo que, no Orçamento, foi estabelecido*". Non-official translation: "this member's bill is justified because the Government failed to comply with what was established in the State Budget".

[38] Plenary session in the Parliament of June 24th, 1998. Speech of a member of the political party leading the government "*A prioridade dada no apoio directo às empresas parece-nos discutível, porque se deveriam privilegiar as políticas de "qualidade de meios" (...) Optou-se, ainda, por medidas de benefício fiscal como instrumento de promoção ao investimento, que são caras e de reduzida eficácia em comparação com outros instrumentos já existentes. (...) A solução técnica encontrada para dar corpo a essas medidas não nos parece adequada, porque é pouco clara e, sobretudo, carece de especificação a par de alguns artigos que só podem ser entendidos se a redacção estiver errada ou manifestamente desajustada*."

Non-official translation: "The priority given to the direct support to firms is questionable, because the focus should be on the "quality of resources" (…) indeed, the option of instrument to promote investment was tax incentives, which are expensive and of limited effectiveness when comparing with other instruments already in place (…) The technical solution for these measures [defined by the most important opposition political party in the Parliament] does not seem appropriate [to the political party leading the Government] because it is unclear and, above all, there is lack of technical specification and some articles can only be understood [by the political party leading the Government] as wrong or as a manifestly inappropriate wording."

the Member's bill, but they did not agree with the bill's structure. The parliamentary group supporting the government abstained in the voting on the details, while all the opposition parliamentary groups voted favourably. The bill was further passed with unanimity in the final overall vote.

In September of 1999, Law No. 171/99 was passed, entering in force on January 1st, 2000, conditional on the publishing the list of eligible municipalities. However, the list of eligible municipalities was only published during the fourth quarter of 2001. Consequently, the entering in force of the Portuguese tax incentives to inlandness was delayed until the fiscal year beginning on January 1st, 2001 (see the chronology in Table 4.10).

The tax incentives were based in three groups of measures: (i) lower taxable income, (iii) exemption of non-income taxes, and (iii) reduced corporate income tax rates. In the first group of measures, mandatory social security contributions supported by firms were considered as being 150 percent of the cost value for the purpose of determining taxable income. Another measure for lowering the taxable income was related to investment expenses (excluding land and passenger vehicles) of up to 500,000 Euros, in which firms benefitted from an additional deduction for depreciation of 30 percent.

The exemption of non-income taxes consisted of two measures. When positive net job creation takes place, a firm could be exempt from social security contributions. The normal exemption period was 3 years, although it could be extended for up to 5 in the case of a firm owned by a young entrepreneur. After the normal exemption period, exemptions of social security contributions were gradually reduced to two thirds and one-third in the first and second years respectively. The second measure of exemption of non-income taxes was related to the purchase of a first permanent home by young

people between 18 and 35 years' old. Buyers could be exempt from municipality taxes on property transfers under certain conditions.

The third group of measures consists of reduced corporate income tax rates. Most entities refer to the tax incentives to inlandness as exclusively being the introduction of reduced corporate income tax rates. With such tax incentives, new firms and established firms in eligible municipalities benefitted in 2001 from a reduction in the corporate income tax rate from 32% to 25% (Table 4.1).[39] The amount of tax incentives resulting from the reduced corporate income tax rates was limited to 100,000 Euros per firm, for periods of 3 years, and when exceeding this limit, firms were subject to statutory corporate income tax rates.[40]

Law No. 55-B/2004, of 30th December, included these tax incentives in the Portuguese Tax Benefits Code. At the same time, the corporate income tax rate applicable for eligible municipalities was further reduced for the fiscal years from 2005 onwards. For existing firms, the tax rate was lowered to 20%, and for new firms located in eligible municipalities, the tax rate was lowered to 15%. The Portuguese government introduced another reduction for the fiscal years from 2008 onwards. In 2011, all the tax incentives were abolished through the publication of the 2012 State Budget.[41] The general condition for firms to qualify for these tax incentives was the requirement to exercise their main activity within beneficiary municipalities. Firms had to have their headquarters or effective management in eligible municipalities, and had to concentrate more than 75 percent of their employees in such municipalities.

[39] Initially a differentiation between new firms and established firms was scheduled. For the latter group, the reduced corporate income tax rate was 25%, whilst for new firms the reduced corporate income tax rate was 20% for the first five years. However, Law No. 30-C/2000 reviewed the reduced corporate income tax rates and defined a tax rate of 25% for both existing firms and new firms.

[40] Ministerial Order No. 170/2002, of February 28th.

[41] Law No. 64-B/2011, of December 30th.

Under these tax incentives, 174 of the 278 Portuguese municipalities on the mainland were selected (the left-hand side map of Figure 4.1), and in 6 of them, the tax incentives were only applicable for specific parishes. As we use data at a municipality level, the portion of eligible parishes for these 6 municipalities was examined. As a result, 4 of these municipalities were considered in our estimations as being non-eligible, as the portion of eligible parishes was below 50%. Thus, in our estimations, 170 of the 278 Portuguese municipalities on the mainland benefitted from the tax incentives. After the second revision of the tax incentives, the list of eligible municipalities changed slightly, entering in force from 2009 onwards. 7 new eligible municipalities were added, and some of the parishes of 4 municipalities were removed, which had previously been eligible. In our specifications eligible municipalities are constant over time.

Beneficiary municipalities were defined according to five criteria: (i) population density; (ii) production and income level; (iii) level of purchasing power; (iv) being located in a region suffering from inlandness issues, and; (v) ensuring territorial contiguity on the mainland. The criteria for defining which municipalities were to be eligible for the tax incentives were clarified by the Ministerial Order No. 2086/2001. The list of beneficiary regions and eligibility criteria were much the same as those initially foreseen in 1998.[42] The initial estimated loss of tax related to these tax incentives was about 1 per cent of total tax revenues from corporate taxes, and it was aimed to cover about 36,000 Portuguese firms.

To the best of our knowledge, no previous reliable study exists which assesses the effectiveness of this regional fiscal policy. Fernandes, Dinis, and Ussmane (2011) use

[42] The first official available list of eligible municipalities is found in the Internal Communication (or Circular-Letter) from the Department of Corporate Income Tax Services No. 147, and this was followed by the Ministerial Orders No. 2086/2001 and No. 1467-A/2001.

aggregate data at district level between 2004 and 2007, and perform a macro analysis based just on ratios. Our study using a unique firm-level dataset considerably differs from Fernandes et al. (2011) study.

Table 4.10: Chronology of the legislative process of the Portuguese tax incentives to inlandness

Legislation	Description
Law No. 127-B/97, December 20th (State Budget 1998)	This Law authorises the Government to create an incentive system applicable for micro and small firms.
Members' bill (Projeto de Lei) No. 522/VII, May 13th, 1998	The most important opposition political party in the Portuguese Parliament issued a bill for an incentive system to trigger the location of new firms in the Interior region of Portugal.
Law No. 171/99, September 18th	This Law establishes the Portuguese tax incentives to inlandness to enter in force in January 1st, 2000, and defines the general criteria for municipalities to qualify for these tax incentives.
Law No. 30-C/2000, December 29th	The Portuguese Parliament establishes a deadline of 60 days for the Government to define objective criteria and issues the list of eligible municipalities. It also reviewed the corporate income tax rate applicable for eligible municipalities (amending Law No. 171/99).
Circular-Letter No. 147, March 30th, 2001	Preliminary issue of the list of eligible municipalities. Establishes the effective date of entering in force – January 1st, 2001.
Decree-Law No. 310/2001, December 10th	Defines some rules to ensure a proper implementation of the tax incentives. This follows the 'no objection' decision of the European Commission regarding these tax incentives.
Ministerial Order No. 2086/2001, December 13th	This Ministerial Order lays down (again) eligible criteria and eligible municipalities.
Ministerial Order No. 1467-A/2001, December 31st	Definition of eligible criteria and eligible municipalities (same content as the Ministerial Order No. 2086/2001).
Ministerial Order No. 170/2002, February 28th	Following the European Commission's decision regarding the tax incentives, this Ministerial Order publishes excluded industries, as well as the limit of incentives per region, and per firm.
Law No. 55-B/2004, December 30th	Incorporates the tax incentives to inlandness into the Portuguese Tax Benefits Code. Lowers even further the corporate income tax rate applicable for eligible municipalities in the inland region. Established different reduced corporate income tax rates for existing and new firms. Entered in force in 2005.
Law No. 67-A/2007, December 31st	Lowers even further the corporate income tax rate applicable for eligible municipalities in the inland region, entering in force in 2008.
Decree-Law No. 55/2008, March 26th	Adjust the eligible criteria for the tax incentives to inlandness.
Ministerial Order No. 1117/2009, September 30th	Issue of a new list of eligible municipalities (much the same as the previous list). Entered in force from 2009 onwards (as set by Decree-Law No. 55/2008).
Law No. 64-B/2011, December 30th	Abolishes the Portuguese tax incentives to inlandness after 2011.

Appendix F. Assessment of the selection of eligible municipalities

The decision as to which municipalities qualify for the tax incentives was made considering a set of criteria, although it might have been biased by political influence (endogeneity). Appendix E describes the five criteria by which eligible municipalities were selected. To control for population density, data is used on the annual average resident population, divided by perimeter territory, and is further transformed to measure the population density per 1,000 inhabitants ($DENSITY_{ct}$). To control for purchasing power, per capita purchasing power per 1,000 inhabitants ($P.POWER_{ct}$) is used. There is no available municipality-level information regarding the level of production and the level of income from before 2004. However, data are available regarding GDP per NUTS level 3 since 1995. This proxy exhibits high multicollinearity with purchasing power, whilst not affecting the statistical significance of other regressors, and therefore it was not included. To capture the fourth and fifth criteria, a fixed effect specification for the 28 Portuguese regions r on the mainland included in NUTS level 3 ($NUTS_c$) is introduced.

As the legislative process of tax incentives involved primarily the most important opposition political party in the Parliament (the Social Democratic Party) and the political party supporting the Government (the Socialist Party), we control for these two political forces. A dummy variable is created taking the value one from 2001 onwards, if the political party which won the elections of 1997 for municipal mayors is the same as the political party leading the government (GOV_c) from 1995 through to 2002. A similar variable was constructed, considering whether the political party leading the municipality after the local elections of 1997 is the same as the most important

opposition political party in the Parliament (OPP_c) from 1995 through to 2002. Municipal mayors were elected in 1997 for a four-year term of governance, whereas the most important opposition political party in the parliament proposed the Portuguese tax incentives to inlandness in 1998 through a Members' bill. Thus, we estimate the following linear probability model:

$$INLAND_c = \beta_0 + \beta_1 P.POWER_{ct} + \beta_2 DENSITY_{ct} + \beta_3 GOV_c + \beta_4 OPP_c + \sum_{t=1995}^{2000} \Upsilon_t + \sum_{r=1}^{28} NUTS_r + \varepsilon_{ct} \quad (4)$$

where $INLAND_c$ takes the value one, if in 2001 the municipality became eligible for the Portuguese tax incentives to inlandness, and Υ_t includes the time fixed effect specification. The time range runs from 1995 to 2000.

Level of purchasing power and population density are considered in the Portuguese Law as being the most important factors for the decision as to which municipalities are to be a beneficiary of the tax incentives, and we thus expect a negative coefficient for both variables. Results in Table 4.11 are about as expected, although by including the dummy variable for NUTS level 3, the sign of coefficient for population density is different from that predicted. Same results hold when considering a municipality-fixed effect specification, instead of fixed effects at NUTS level 3 (the results are not reported for parsimony).

The under-identification test provides weak support for the endogeneity of the treatment variable. That is to say, questions arise as to whether the decision of which municipalities qualify for the tax incentives is in fact endogenous, although the instrument proposed to control for potential endogeneity appears to be a proper one from the weak identification test. From the time range under analysis in this study, our

instrumental variable is positively correlated with eligible municipalities for the tax incentives, whilst it is not correlated with residuals from equation (1) illustrated in the first column of Table 4.5.[43]

Table 4.11: Assessment the selection of eligible municipalities (1995 through to 2000)

	Linear probability model			
	(1)	(2)	(3)	(4)
$P.POWER_{ct}$	-7.663***	-3.577***	-3.456***	-3.446***
	(0.512)	(0.387)	(0.382)	(0.382)
$DENSITY_{ct}$	-0.005	0.028**	0.027**	0.027**
	(0.027)	(0.012)	(0.011)	(0.011)
GOV_c			0.011	
			(0.016)	
OPP_c			0.041**	0.031**
			(0.019)	(0.014)
NUTS 3 FE	NO	YES	YES	YES
Year FE	YES	YES	YES	YES
N	1,650	1,650	1,650	1,650
Adjusted R^2	0.243	0.788	0.789	0.789

Notes: Analysis of the criteria underlying the decision of which municipalities are to benefit from the *Portuguese tax incentives to inlandness*. The sample consists of municipality level observations from 1995 to 2000. A linear probability model is performed, considering *INLAND* as dependent variable: a dummy taking the value 1, if the municipality was beneficiary from the *Portuguese tax incentives to inlandness*, and 0 otherwise.

$INLAND_c = \beta_0 + \beta_1 P.POWER_{ct} + \beta_2 DENSITY_{ct} + \beta_3 GOV_c + \beta_4 OPP_c + \sum_{t=1995}^{2000} Y_t + \sum_{r=1}^{28} NUTS_r + \varepsilon_{ct}$

Independent variables are: *P.POWER* = per capita purchasing power per 1,000 inhabitants at municipality level; *DENSITY* = population density per 1,000 inhabitants at municipality level; *GOV* = a dummy variable taking the value 1 if the municipal mayor elected in 1997 is affiliated to the political party leading the government, and 0 otherwise; *OPP* = a dummy variable taking the value 1 if the municipal mayor elected in 1997 is affiliated to the most important opposition political party in the Parliament. Is also included a fixed effect specification for year and NUTS level 3 territorial unit. The proposal was passed in 1999, to be enforced in 2000, although it only effectively entered in force in 2001.

Coefficients for some controls are not reported. Standard errors clustered at the municipality level are in parentheses, and the symbols *, **, and *** represent significant levels of 10%, 5%, and 1%, respectively.

The most important opposition political party in the Parliament appears to have had significant influence in the selection of eligible municipalities for the tax incentives. Results in columns (3) and (4) suggest that when the legislative process started through

[43] Coefficient of the linear relation between OPP_c and $INLAND_{ct}$ of 0.082 (*t-stat* 11.63; *p-value* 0.000), which suggests that the instrumental variable correlate with the endogenous variable in the period 2001-2009. 0.104 is the coefficient of the linear regression of the residuals of main equation (ε_{mct}) in column (1) of Table 4.5, over OPP_c (*t-stat* 0.80; *p-value* 0.425), which suggests that values of the instrumental variable are unrelated to error values in the structural model.

the Members' bill, municipalities with a mayor who supported the most important opposition political party in the Parliament were more likely to benefit from the tax incentives. This result is coherent with the legislative process in the Portuguese Parliament (described in Appendix E), as the tax incentives were created as a consequence of a political initiative from the most important opposition political party. Results are the same for the period from 1997 through to 2000.

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5. Conclusions and Contributions

5.1. Conclusions, Contributions to Literature and Limitations

Chapter 2, which is entitled "Corporate Taxation and Financial Reporting Quality" aims to understand better the influence of countries tax enforcement on firms' financial reporting quality. Whilst Hanlon, Hoopes, and Shroff (2014) argue that there is a positive effect between tax enforcement and financial reporting quality in a US based study, in a European-oriented study, we propose that such a relation varies with firms' level of tax avoidance. In a sample of 797 firms listed on the stock exchanges of 14 European countries from 2005 to 2011, we predict and confirm that, for Europe, tax enforcement exerts a positive effect on firms' financial reporting quality, although this is more prevalent in firms that are engaged in greater tax avoidance. It appears that tax enforcement has less impact on firms engaged in less tax avoidance.

This study contributes to the literature in several ways. Firstly, we predict and find that there is an overall positive relation in Europe between tax enforcement by tax administrations and firms' financial reporting quality. This result support findings that are already addressed in the literature, albeit focussed in the US (e.g., Hanlon et al. (2014)). Secondly, we provide evidence that firms' level of tax avoidance shapes this relation differently. As such, this study is in line with those studies that examine firms' response to audit threats from warning letters signalling audit probabilities (e.g., Slemrod, Blumenthal, and Christian (2001); Wenzel and Taylor (2004); Telle (2013); Carrillo, Pomeranz, and Singhal (2014); Pomeranz, Marshall, and Castellon (2014); Castro and Scartascini (2015)). Thirdly, our study assesses whether tax system

characteristics and institutional variability changes prior conclusions. Nevertheless, we fail to document a different influence on the relation between tax enforcement and financial reporting quality. This latter finding raises questions as to whether other country level characteristics matter when firms' trade-off the benefits of tax avoidance with the expected penalty of detection.

One caveat of this study is that data on tax enforcement only vary per country, and by year. Using proxies for tax enforcement that only vary per country and year, we may well not capture different enforcement patterns, such as industry specific ones. The use of a fixed-effect specification for industry would somewhat overcome this concern, although we do not have any detailed data to perform this specification. It would be preferable to measure enforcement by tax administrations at firm level, although it is hard to obtain comprehensive data directly from each tax administration. Moreover, our sample covers firms in European countries that adopted IFRS, and our findings might not hold for firms that prepare financial reporting under other accounting standards (e.g., US GAAP).

Chapter 3 – "Disclosure of Income Taxes and Firm Value: a Cross Country Comparison of IFRS Adopters" – analyses the impact of disclosure of tax information in the notes to the financial statements on firms' value. We develop a disclosure index for 2012, based on hand-collected data from 185 firms listed on the main stock indexes of 8 European countries, all of them IFRS adopters. Empirical evidence shows that firms engaged in more tax avoidance disclose more mandatory information about income taxes in the notes to the financial statements, although we find no effect regarding the voluntary disclosure of income taxes. Results suggest no direct relation between mandatory disclosure of income taxes and firms' value. However, when the

level of tax avoidance is taken into consideration the association is significant. Tax avoidance strategies are viewed by investors with scepticism, although disclosure of income taxes mitigates that negative effect, especially for firms engaged in more tax avoidance and for "poorly"-governed firms, which is measured by lower institutional ownership.

This paper contributes to the current literature for several reasons. Firstly, to the best of our knowledge, it is the first study to focus on all IAS 12 disclosure requirements. Kvaal and Nobes (2013) only focus on two numerical reconciliations mandated by IAS 12. Wahab and Holland (2012) focus on the reconciliation between actual tax expense and notional expense, which is required by IAS 12 that have to be disclosed in the notes to the financial statements. Nonetheless, the scope of both studies is well distanced from ours. Our focus is on IFRS adopters in Europe, rather than in the US, on which most of the literature is based. Secondly, the features of our hand-collected data makes it possible to distinguish between mandatory and voluntary disclosure of income taxes, and we find different patterns between the two types of disclosure. This distinction has revealed interesting features because: we find that both measures of disclosure are not affected by the same determinants, and; we find that the effect of disclosure of income taxes on firms' value is not the same, whether one considers mandatory disclosure or voluntary disclosure. This paper contributes to the current debate on how tax avoidance strategies are linked to firms' value. Desai and Dharmapala (2009) show that the quality of corporate governance is the key for that relation. We add to the literature the finding that disclosure of income taxes might also play a role in shaping the relation between tax avoidance and firms' value.

One might argue that there is an incidence of measurement error in our proxies for disclosure of income taxes, as this is based on hand-collected data. However, in our view, hand-collected data is powerful in capturing disclosure elements that are firm-specific. Indeed, this procedure made it possible to distinguish between disclosure of income taxes according to the IAS 12 requirements (mandatory disclosure), and disclosure of income taxes exceeding IAS 12 requirements (voluntary disclosure). The level of disclosure should be stable throughout time (Botosan, 1997). Even so, data for more years and countries would strengthen results.

In Chapter 4, entitled "Crossing the Border: Regional Tax Differences and Firm Creation", the question of whether the introduction of reduced corporate income tax rates at regional level increases firm creation is studied. To answer this question, a unique matched employer-employee dataset (*Quadros de Pessoal*) is used, which contains detailed information from approximately 345,000 firms per year, covering virtually all Portuguese private firms. The data range goes from 1995 to 2009. Reduced corporate income tax rates were introduced in 2001 for 170 of the 278 municipalities on the mainland. Our results suggest that introducing reduced corporate income tax rates exerts a positive and robust effect on firm entry. The effect is significant in the period just after the creation of a tax rate differential between regions, whilst it is inconclusive whether further variations in the tax rate differential generates greater firm entry. This finding contrasts with the existing evidence, as is claimed that it is the creation of a tax rate differential between regions which triggers new firms, rather than further variations. Moreover, job creation appears to be positively affected.

This study contributes to extend the current literature on taxes and entrepreneurship, which, to date, has not reached a broad consensus. This study highlights that

introducing reduced corporate income tax rates for specific regions within a country fosters firm creation. The view of the tax competition literature is validated when considering competition on tax rates between neighbouring municipalities, as our results suggest that entrepreneurs tend to cross the border to be located on the lower taxed area. Moreover, there is some support for the influence of agglomeration economies on the location of new firms, whereby these new firms are typically small in size, and characterised by low levels of technological intensity. A controversy in the literature regards the small size and weak innovative ability of new firms (Shane, 2009). For instance, Santarelli and Vivarelli (2007) suggest that politicians should be worried about the excess of entry, and Shane (2009) raises concerns about the quality of entry. Our findings support these arguments to a degree.

The proxy for firm entry rate is widely used in the literature, and robustness analysis using other proxy for firm creation validated our results. However, the proxy for job creation might be misleading, as we are measuring job creation as being the number of employees per new firm. In fact, job creation would be better assessed by using variations in total employment at municipality level. Unfortunately, we could not obtain comprehensive data at municipality level on this variable within our time range.

5.2. Contributions to Practice

This section is motivated by Zingales (2015) claim that "we [i.e., researchers] need to better explain and document the contribution of finance to society". The research developed in the empirical paper in Chapter 2 concentrates on the consequences of enforcement by tax administrations. Field experiments have demonstrated that if the tax administrations enforce more, firms became more compliant with tax rules. Our focus is

on whether the quality of financial information reported to outsiders is indeed improved with higher enforcement, and that this may be improved if tax enforcement constrains firms' ability to avoid paying taxes. The findings suggest that firms that are engaged in less tax avoidance already report financial information of a higher quality. On the contrary, firms engaged in greater tax avoidance exhibit lower financial reporting quality, although this quality is improved with an increase in tax enforcement. This effect is driven by tax enforcement constrains over firms' tax avoidance strategies. Financial information serves several stakeholders, including the tax administration (Bozanic, Hoopes, Thornock, & Williams, 2015). Therefore, from the tax administration's point of view, higher enforcement on these firms might spread a twofold practical benefit. Firstly, the increase in enforcement should mitigate firms' incentives to avoid paying taxes, thus enhancing the amount of tax collected. Secondly, as this indirectly improves the quality of financial reporting, tax administrations should also improve one source of information that they use to assess their interest in forthcoming firms' pre-tax profits – firms' financial statements.

Empirical paper in Chapter 3 addresses insights to practitioners by focussing on the notes to the financial statements. Financial statements, including their notes, are a preferable source of information about firms, accordingly to a recent survey carried out by the CFA Institute.[44] Our findings suggest a subtle and important point regarding the informational content of disclosure of income taxes into financial statements that has implications on firms' valuation. Firstly, firms whose disclosure is more compliant with IAS 12 (mandatory disclosure of income taxes) signals firms' involvement in tax avoidance strategies. Secondly, disclosure beyond the requirements of IAS 12

[44] Financial statements are preferred by about 39 percent of respondents when surveyed about their preferred source of information about firms. This is available online at: http://blogs.cfainstitute.org/investor/2015/08/20/where-to-find-valuable-investment-information/ .

(voluntary disclosure of income taxes) might signal the presence of negative earnings and dropping sales, rather than signalling an involvement in tax avoidance strategies. Moreover, our findings suggest that users of financial statements, especially shareholders who aim to protect their share value, should not be worried about disclosure that is compliant with IAS 12, for at least two reasons. Firstly, firms appear to use disclosure of income taxes as a way of mitigating information asymmetry when engaged in more tax avoidance. Secondly, for those firms engaged in less tax avoidance, there is no apparent relation between the information on income taxes disclosed and the firms' pricing, and thus this information appears to be of minor relevance. Shareholders might also not be sensitive about disclosure of income taxes if their shares are related to firms with stronger governance mechanisms. Therefore, the empirical paper in Chapter 3 helps stakeholders in understanding the determinants and consequences of firm's disclosures of income taxes.

The empirical paper in Chapter 4 contributes to helping policymakers define and implement effective fiscal policies, such as the introduction of reduced corporate income tax rates under the Portuguese tax incentives to inlandness. Our results suggest that, before introducing fiscal policies, policymakers need to be well aware as to what extent entrepreneurial activity is sensitive to taxation, as policies might not be structured to achieve the proposed goals:

> "Tax rules adopted for the purpose of achieving certain social goals are generally too broad, and the rules themselves encourage some taxpayers to exploit their ambiguity and, as a result, lead to some socially undesirable economic activity, those activities undertaken in response to the tax laws by taxpayers that were unanticipated or not intended by legislators." (Scholes, Wolfson, Erickson, Maydew, & Shevlin, 2009, p. 19)

The findings suggest that fiscal policies, such as the introduction of reduced corporate income tax rates for specific regions, increases rates of firm creation. However, the intended effects might be found only during the period surrounding the tax change, thus making this fiscal policy ineffective in the long-run. Moreover, the type of tax incentive studied in Chapter 4 has mainly influenced the creation of small firms, which are categorised as having low or medium-low levels of technological intensity. Per capita purchasing power in eligible municipalities grew 19.2% with the tax change (1995 through to 2000, versus 2001 through to 2009), while in non-eligible municipalities, the improvement was just 8.3%.[45] However, population density decreased in eligible municipalities (-1.5%), as opposed to non-eligible municipalities (+3.8%). Nevertheless, empirical evidence for Portugal warns for the time lag necessary for firm formation to influence employment growth (Baptista, Escaria, & Madruga, 2008). There is a criticism as to whether tax incentives are effective in triggering firm creation, which in turn improves economic development. We adopt the words of Shane (2009) to conclude that new firms created as a consequence of the introduction of reduced corporate income tax rates turned out not to be a "magic bullet that will transform depressed economic regions", although they might slightly affected the economic growth of target regions.

[45] See Table 4.4 in Appendix D for a detailed analysis.

5.3. References

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